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## BRIEFLY TOLD.

THE WORCESTER GAS AND ELECTRIC LIGHT COMPANIES MAY NOT CONSOLIDATE.—On pages 845-6 of this issue of the JOURNAL will be found the text of the decision of the Massachusetts State Gas and Electric Light Commission, in respect to the petitions of the Worcester Gas Light and the Worcester Electric Light Companies for the Board's sanction of an agreement previously entered into between the proprictors of the respective Companies for a consolidation of their franchises, powers and business. The decision, which is opposed to the petition, will, we imagine, be received with no little surprise, as there was nothing in the preliminary negotiations, or in their subsequent harmonizing, in the slightest degree in opposition to the proposition. The stockholders of both Companies were practically unanimous in the belief that their mutual interests would be better served in union than in disunion, and that the electric division of the merged business could be conducted with greater economy under the proposed new arrangement. Nor did the gas or electric light consumers of Worcester signify, either by public murmuring, or by stated protest at the hearing appointed by the Commission for the purpose of taking the public pulse in respect to the proposition, that the merger agreement was distasteful to them or that it put their purses in danger of depletion. Certainly the public of Worcester had ample and positive warning of the project, for the daily papers of their city had from time to time, and well in advance, printed prominently the very minutia of the barter and sale that the Companies intended to consummate, with the protection of the law.

Surprise having given way to a desire for determining or digesting the reasons advanced by the Commission for its negative decision, wonder creeps in when it is found that the stated reasons are, to say the least, feeble even to wavering. The first paragraphs of the decision show that the companies had complied with every provision of the law, and that the people of the city affected had offered no objection, hence it would seem quite fair and reasonable that the petitioners very properly rested "their case chiefly upon the ground" that "no one appeared at the hearing to oppose it." What other course was open, or what necessity existed for any different action by the petitioners. Was any case ever advanced by conjuring up defences against charges that were never propounded? Or was anyone ever convinced by oratory or argument that was addressed to empty space? Nor do we appreciate the appositeness of the Commissioners' citation of the New Bedford case which is put forward as a parallel to the Worcester instance. There was opposition in the former example—perhaps not pronounced, but certainly prolonged—and it was made by the consumers. Still this is not mentioned as evidence of our belief that the opposition of the New Bedford consumers was tenable; for they knew that consolidation there could not fail to result in a raise in lighting rates, as the competition had been so fierce that both gas and electric lights were sold at prices little short of ruinous to the sellers, and the Commission must have known that such a state of affairs could not exist after a certain point in the struggle had been reached. Nor does the New Bedford instance parallel the Worcester one, in that it was not shown in the latter case that "any benefit" was "likely to accrue from the consolidation proposed." We think it was shown and with positiveness. The paragraph of reference to the

New Bedford case further contains, to our mind, some evidence that the Commissioners are not overpleased with an assumption on the part of a petitioner before them who has complied with the forms of law, and who meets with no objection from those more or less affected, that his "request would be granted as a matter of course." We fear that we would share the thoughts of the petitioner, were we similarly situated. And, certainly, the Commissioners do not in their comment in this particular, wish to be construed as holding that the petitioner should first come before them for consent, without a knowledge beforehand that those behind him are not liable to block the way subsequently, or without a record that the forms of law have been complied with up to the point that gives him a standing before the Commission as a petitioner.

In respect to the statement that the Board had been unable to "find that any appreciable saving in the conduct of its affairs, or in the manufacture of its product could be secured by the transfer of this business to the Gas Company," we must take issue. It is fair to assume that the executive officers of the Electric Light Company would not be overpaid did they receive, in the aggregate, salaries or compensation amounting to $10,000 per annum—in case they do not receive salaries equal to that sum, it is comparatively easy to understand why the Company can pay a fair dividend on the invested capital. Taking it for granted that such a sum is paid out, amalgamation ought to result in a saving of at least $\frac{7}{10}$ of the money so disbursed. Since the capital of the Electric Company is $200,000, here we would have off-hand a saving of 3½ per cent. on the stock, and those actively engaged in the business of gas or electric light supply need not be told where several other smaller economies could be practiced (they require not to be named here) that would result in Worcester in a further saving of an amount equal to 1½ per cent. on the shares, or a total of 5 per cent. Is not that an important saving? It is possible that the intimation contained in the paragraph that "Although the management of the electric light business has been able, it has not been costly," furnishes a clue to the willingness of the Company to merge with its rival, for perhaps the "able management" has ceased to regard the pay as commensurate with the service rendered. The remainder of the decision is as forceless, in our opinion, as that which has been quoted, and we fail to see where a case in support of the verdict has been made out.

In the meantime, this setback, if it is accepted as final, may possibly be a blessing in disguise to the owners of the Worcester Gas Light Company; for we certainly are not, in our present light, ardent believers in the policy of operating gas and electric lighting plants in combination. Situation and circumstances are the factors that must yet be the guides in this direction; and they do not seem to us to point that way in the Worcester example.

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Public Lighting, New York City.—The authorities and the electric light companies of New York have again locked horns over the terms on which the one will receive and the other supply arc lights in the metropolis for the coming year. In response to the invitation of the Gas Commission for tenders, the following bids were submitted:

| Company. | No. Lamps. | Rate per Night. |
|---|---|---|
| United States | 307 | 43 cents. |
| Brush | 289 | 43 " |
| " | 152 | 45 " |
| East River | 247 | 44½ " |
| Mount Morris | 171 | 43 " |
| Harlem | 192 | 43 " |
| " | 19 | 50 " |
| North New York | 28 | 50 " |

The bidders submitted tenders for lamps in districts only in their own respective territories, and there was no attempt at competition. This year the average rate paid per lamp was 39.8 cents per night, and as the proposed price for the ensuing year would be greatly in excess of the funds set apart for the work, the Commission rejected all the tenders. The Companies, however, contend that they cannot supply the lights at a lower figure, and there is every probability that the struggle of a year ago, minus the pole levelling and wire cutting of that memorable time, is to be gone over again.

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Combination at Plainfeld, N. J.—Supplementary to the hint in our item columns, we may note that a new Company, to be known as the Plainfield Gas and Electric Light Company, has been organized by H. G. Runkle and E. R. Pope, of that place, and Wm. Runkle, of Orange, N. J. The new Company buys an unexpired lease (to run for 15 years) of the Plainfield Gas Company, and the plant and rights of the Plainfield Electric Light Company—Westinghouse system. A majority of the stock of the present Gas Company is held by the new Company. The city pays $14.60 per lamp per annum for incandescent (16-candle power) electric lamps in the city proper, and $17.50 per lamp for those in the suburbs—every night and all night schedule.

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The Edison Company has received the contract for lighting North Plainfield, N. J., with incandescent lamps, the rate to be $18 each per annum—all night and every night schedule. The contract is to last for three years. It was originally intended to use a water power, located 5 miles from the town, but it has lately been decided to put in a steam plant. The Company is now erecting its poles, the poor quality of which is creating much discontent.

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[Prepared for the Journal.]

## Sampling Coal for Analysis.

By Dr. Durand Woodman.

When it is remembered that the value of an analysis of a gas coal depends on whether the sample represents the *average* quality of the coal in question or not, it is at once manifest that the proper selection of the sample is a matter of the utmost importance.

Unfortunately, in many instances, this is not understood, and in case the results in the retort house differ considerably from those anticipated from the analysis, the chemist receives the blame in one form or another, while the "practical man" details, with satisfaction, the wide difference in actual working results from those predicted—from what? An analysis of a *misrepresentative* sample. A couple of "nice pieces" are often picked out, boxed up and sent off. If they represent the average quality of the coal it is either the result of accident or coincidence, or the coal happens to be extremely uniform in quality.

A sample of coal should be taken with as much care and by the same general method as a sample of ore. Approximately equal portions of any convenient weight should be taken from as many parts of the cargo or general storage heap as possible, and thrown into a small pile, which may amount to half a ton or more. The large pieces should be broken down and the whole well mixed by shoveling. The conical pile resulting is then divided into quarters, two opposite quarters should be rejected and removed, the two remaining well mixed, again quartered and treated as before; repeating this operation until about five pounds remain. One half of this should be sent for analysis; the other reserved and retained until no further interest in it is likely to develop. The importance of taking this trouble cannot be overestimated if the analytical results are to be of any real value. When a sample of coal comes for analysis in two or three good sized, good-looking pieces, it is usually safe to conclude that they are "best selected," and not representative average; for by the very nature of a correct sampling process the result should be in small pieces with a reasonable amount of "slack." The chemist should then repeat the process on this crude sample to obtain a suitable quantity for analysis. That the analysis and the practical result should agree accurately is hardly to be expected under any circumstances, but misleading results may be obtained which proper care in sampling would have transformed into a close approximation, both useful and satisfactory.

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## The Market for Gas Securities.

During the week the money market was in a very unsettled condition, with a tendency towards a still tighter drawing in of the bankers' purse strings. As a consequence, the lowest rates yet made in shares during the '90 squeeze were reported. Consolidated sold down to 85¼ early in the week, but rallied somewhat, although with nothing like the rebound that should have been recorded. To-day (Friday) the shares opened at 88½ to 89½, with sales at 88⅝, and the tone was somewhat better. Holders of these shares for investment need not have any fear as to the outcome. The stock is worth more now, on the basis of profits earned and business that is being done by the Company, than it was at any other period in its history. Other city shares are firmly held, and an advance of a point or so has been made in Standard preferred; the preferred is offered at 90, the common at 48. Brooklyn shares are fairly well maintained. Chicago is a trifle better than it was a week ago, and it is bound to go higher.

The annual meeting of the stockholders of the Laclede Gas Light Company, of St. Louis, which was to have been held on the 10th inst., is postponed to the third Thursday in January. Secretary Katzenberger, of the Equitable Gas Light Company, of Memphis, Tenn, announces that the books will be closed to-day, to be reopened on the first inst., in order to permit the payment of a quarterly dividend of 1 per cent. The Central Trust Company, of this city, is the custodian of the transfer books. The Conshohocton (Pa,) Gas and Water Company has declared a dividend of 3 per cent. on both the common and preferred, also a 10 per cent. stock dividend on the common. The dividend on the common is payable to-day, the stock dividend is claimable on Jan. 15th, and the preferred dividend was payable on demand.

[A paper read before the Society of Gas Lighting.]

## The Value of a Water Gas Plant as Auxiliary to a Coal Gas Plant.

By Mr. A. B. Slater.

The condition of the gas coal supply during the past six months has brought prominently to our notice questions involving the uninterrupted supply of illuminating gas in all our cities and towns, and to such gas companies as still depend upon coal gas alone the subject of this paper may perhaps have more importance at the present time than has heretofore been given it. Connected with all the great manufacturing industries of this country, there is probably no one question or subject which demands more earnest attention, and which calls for the exercise of sound judgment and wise counsel from the managers of our industrial establishments than the "labor question." The "tariff" and "free trade" problems excite widespread attention, not only throughout the United States but all over the world, and the effect of whatever action is taken by Congress reaches through all sections of the country and affects to a greater or less extent all our industries.

But the "labor question" is, if possible, of still greater importance, because labor is the grand, paramount, motive power of civilization. Next to the supply of material for the manufacture of illuminating gas is this same question of labor. If, from adverse conditions, the proprietors of most manufacturing concerns deem it wise to stop they can do so, involving as it does simple a question of dollars and cents.

But the gas companies *must* keep up their supply of gas at all times. When an electric light works stop their supply of light, as is quite often the fact, most of their customers fall back on their old surety—gas; and it is a very curious fact that when the electric light fails it is taken as a matter of course, as the customers rather expect it at times, and little is said about it. It is almost an unheard of occurrence for a gas company to fail in its supply of gas, and should it occur all the electric light companies could not supply one-half the demand for light to take the place of gas.

These two important factors—material and labor—enter prominently into the consideration of the question of supplementing a coal gas plant with a water gas plant. Never since the better class of American gas coal has been generally used has there been so short a supply in the market for so long a time; but this year we are forcibly reminded that it is not easily obtained when the miner's labor ceases. The quantity of gas coal is practically inexhaustible, but without labor we cannot have it at our works.

In the water gas plant no gas coal is required, but in its place hard coal is used; or when more advantageous, coke may take its place. The question of labor, I think, has seldom affected the gas coal and anthracite regions at the same time, and, as it requires a much less quantity of hard coal to make the same quantity of gas, the chances of failing to obtain a supply are lessened.

For carbureting water gas, oil or naphtha is generally used, the supply of which from past experience and present indications can hardly be questioned; but if it should be a question with the over-cautious manager, while he is thinking and hesitating about it, the "other fellow" will get in his work and take the advantage of it *now*. With a stock of material in store the next point we notice is the fact that the water gas plant for the production of a given quantity of gas per 24 hours requires only about one-third the labor which is necessary to produce the same quantity of gas with the coal gas plant.

While the judgment and intelligence of the foreman in the retort house, in a coal gas works, will be shown by the condition of his benches and retorts, as well as the results obtained, lack of intelligence or carelessness in running the water gas plant will much more visibly affect the results, so that we say it requires a more intelligent man to produce the best results with the water gas plant. Taking it for granted that we have a good apparatus or process and have made a good quality of gas, the next question which arises is: What shall we do with it? That is to say, shall we mix the water gas with the coal gas or shall we stop the coal plant and distribute to our consumers straight water gas? Of course the relative cost of gas coal, oil or naphtha and income from residuals from the coal gas plant are to be considered in determining this question, to the extent that dollars and cents may affect it.

Next to supplying the public with a gas of good and uniform illuminating power, is one of hardly less importance and that is, of keeping the specific gravity as nearly uniform as possible. In fact I have almost come to believe that a gas of high but variable illuminating power is not as satisfactory to the general consumer as *a constant and uniform quality of gas*, both as regards illuminating power and specific gravity, even though the illuminating power be several candles less.

If our consumers have always been accustomed to a coal gas of 17½ or 18-candle power, and specific gravity of .420 to .430, and we stop the coal gas plant and send out straight water gas of even 3 or 4 candles better illuminating power, and specific gravity of say .630 to .670, the change is noticed by the consumer in several ways. One of the first things we observe is that the new gas acts as a solvent for the greater or less collection of tarry matter which has collected for years in the pipes, joints and cocks of old fixtures, and the gas being of a more penetrating nature and a more pungent odor a small leakage is noticed at once, and being of a different odor than the old gas to which the consumers have become accustomed, complaint is made that the gas "stinks."

Again, where gas stoves with atmospheric burners are in use trouble is experienced at once, as the supply of air which was right for the proper combustion of coal gas is entirely too much for water gas, and the air ports of the burners must be readjusted to have them work satisfactorily. Then again, complaint is made that the gas is poor, that is, the light is not satisfactory, even though the candle power is 3 or 4 candles better than the gas to which they have been accustomed. Why is this? The light emitted from a gas burner depends first upon the illuminating power of the gas and secondly upon the area of the flame.

We find that where the pipes, fixtures and burners are barely of sufficient capacity to give, under a given pressure, a certain size of flame with a coal gas of 17½ or 18-candle power, and specific gravity of 0.420 to 0.430, the water gas, although of 21 or 22-candle power, and specific gravity of 0.630 to 0.670, will not give a flame of as large area, particularly where the capacity of pipes is too small, consequently the gas is called poor. We also find that a mixture of, say, 70 or 75 per cent. of coal gas and 25 or 30 per cent. of water gas produces no condition or appearance that is noticeable by the consumers; but when the coal gas works are stopped and only straight water gas is sent out, it is not long before numerous complaints are made that the gas has a very bad odor, and that it gives a poor light—that two burners do not give as good light as one with the coal gas, at the same time the water gas shows 3 to 4 candles better illuminating power on the bar photometer at the office, which is about 1¼ miles from the works.

This condition of things continued with us for three or four months, when, all at once, without any apparent cause, so far as we have been able to discover, the light became brilliant and the flame larger, and the inquiry became general what we had been doing to make the gas so much better. So far we can imagine but one cause, and that is this, that the water gas had softened up or dissolved the tarry matter which had been years in collecting in the old pipes, fixtures, etc., and cleaned them out and allowed the gas to reach the burners in nearly the same condition as it left the works. It is not impossible that one cause of the trouble was the imperfect conversion of the crude Lima oil which we used for carbureting the gas, although the accumulation of carbon in the carburetors, which was the cause of the imperfect conversion of the oil, was discovered and remedied some weeks before complaints began to come in.

The whims, caprice and ignorance of consumers in regard to the proper use of gas, lead to magnifying any real cause for complaint.

It was stated in the newspapers that the gas company were intending to supply water gas, and long before the apparatus was put in operation we had complaints that the new gas was poor and they did not like it as well as the old coal gas; and after straight water gas was supplied to consumers who supposed they were using water gas, but who were really using coal gas, said they would be satisfied if we would give them such gas as their friends had on the other side of the river who were really using water gas.

After some ten months' experience in operating our water gas plant, which is of the improved Lowe, double-superheater type, and supplying both mixed gases and straight water gas, our conclusions may be stated as follows:

*First.* That to consumers who have long been accustomed to coal gas, a mixture of, say, 50 per cent. each of coal gas and water gas properly made is more satisfactory in all respects than either coal or water gas alone, for the reason that a higher illuminating power can be furnished with less liability of trouble from smoke, and the specific gravity being less than straight water gas, a larger flame is obtained, consequently more light, which is due to the larger area of the flame.

*Second.* We are better fortified against trouble arising from short supply of gas coal, particularly when caused by strikes of the miners. We can run our coal gas works to better advantage, because we can keep the retorts constantly at work without the necessity of missing charges and make up with the water gas works any variable demand for gas that is made on account of dark weather or large consumption.

*Third.* In case of any sudden labor trouble, if forced to do so, we can stop the coal gas works and keep the city supplied with gas with the

water gas works, and with one-third the labor necessary to run the coal gas plant.

*Fourth.* We are more independent of fluctuation in prices or cost of material. We can take advantage of circumstances and make more or less of coal or water gas, according as the cost of coal or oil and income from residuals make it advantageous to do so.

*Fifth, and last.* The unprecedented condition of the gas coal supply this present season has convinced us that we acted wisely in putting in the water gas apparatus, even for that reason alone; and with the view of putting our works in the best possible condition to serve our customers to the best advantage, and making still more sure the ability to do so, we are now constructing a water gas plant at our other and larger station, and when it is completed we shall be able to furnish either coal or water gas, or, what I think we shall be more likely to do, so long as present conditions prevail, supply a mixture of about 50 per cent. each of coal and water gas.

## Efficiency in Gas Distribution.

[A paper read by Mr. H. Smythe, of Maidstone, before the Southern District Association of Gas Engineers and Managers. Reprinted from the London *Journal*.]

The rapidly increasing use of gas for domestic and trade purposes makes the subject of efficiency in gas distribution one of growing importance; and I propose in this paper to give you the results of my experience and reflections on the matter, trusting that a discussion will follow thereon, which may be of some practical use to us.

I consider that efficient distribution of gas consists in giving a constant supply of gas at all points where it is required, and in doing this with the lowest possible loss of gas. Much has been done by gas engineers to insure their consumers having all the gas they require, free from interruptions; but it must, I think, be admitted that, owing principally to naphthaline deposits in the pipes, there is still room for improvement in this respect. But the improvement of late years in the matter of unaccounted-for gas has been much more marked, as can be seen by reference to the published accounts of most gas concerns. In "King's Treatise on Coal Gas," which was published about ten years ago, it is stated that the average unaccounted-for gas throughout the country was then about 10 per cent. of the gas made, as against 20 per cent. twenty years previously. I think that the progress since made under this head would justify me in placing the average at the present time at about 5 per cent.; and before long I will not be surprised to find many gas engineers, after allowing, say, 1 per cent. for condensation of their gas, being able to account for all the rest of it.

Fortunately, in taking steps to remedy the one defect we shall be going a long way toward remedying the other; for a full supply of gas can only be given and maintained by providing our consumers with amply big meters and services, leading from amply big mains, and in providing these we will be using distributing plant not so liable to cause loss of gas as with plant of insufficient capacity.

Efficient distribution, however, cannot well be considered without first taking into account that pest of the gas manager, naphthaline. Not more than a partial remedy for the formation of naphthaline in the distributing plant can seem to be provided at the works. We shall consequently find it regularly every winter deposited to a greater or less extent on the interior surfaces of nearly every main and service in our districts. This deposition will not be noticed much in summer. It will have partly dissolved and found its way into the siphons, and have partly evaporated to the benefit of the gas; and the same thing I believe takes place to a great extent in the mains and apparatus at the works. It is therefore necessary, in endeavoring to secure efficiency, to take into account the liability of naphthaline to periodically contract the area of most of the distributing plant, and thereby reduce its capacity. We do not want to have to renew mains and services for many years; so that they should be large enough to supply not only present and future requirements, but allowance should also be made for a diminution of the capacity from depositions of naphthaline. I have for several years had a minimum size of 3 inches for new mains, and 1 inch for new services; but lately I have decided that 4 inches should be the minimum for mains, and for any houses other than cottages not less than 1¼-inch services should be used. For large houses I have lately used 2 and 3-inch cast iron services, which I think will prove efficient and durable; and I consider it very important that all mains and services should be laid not less than 2 feet deep in the ground.

With regard to meters, the size should not be less than 5-light where there is a gas fire or a gas cooker in use. In fact, it is, I think, a question of the near future whether smaller meters than this should continue to be fixed. In the matter of unaccounted-for gas, I can testify to the importance of periodically renewing all the consumers' meters. I have at present adopted the plan of renewing all meters after they have been 10 years in use; but I think that a shorter period than this might be adopted with much advantage. I am also gradually replacing all wet meters with dry ones; so that, with the exception of a few of the largest size, the meters are all of the latter sort.

Main cocks should have a full, clear way, when open, of the same area as the services to which they are fixed; and they should be all tested for soundness before being sent out. I mention this, as I have some difficulty in procuring satisfactory cocks. The public lamps also require consideration, as they are continually before the public, and any deficiency of light from them is much noticed. Here also the services should be large—not less than ¾ inch in diameter up to and including the bend; and the rising pipe ½ inch in diameter to the lamp cock. The cocks should have a good clear way when open; and they should be fixed inside the lamps close to the regulators. The lamps themselves should have slight frames, with close-fitting bottoms as well as sides.

Having referred briefly to the principal points which in my opinion go to constitute an efficient distribution of gas, I would add a few general remarks on the subject. In my own experience, nearly all the interruptions to gas supply are caused by naphthaline. Its formation in the mains and services seems to be caused to a great extent by friction; and as the friction of the gas will be greatest in the mains and services which are small in proportion to the amount of gas passed through them, it follows that these small pipes are most liable to be stopped with naphthaline. If this be correct, then a stopped pipe is a pretty certain indication that that pipe is too small for its work. For some years I have noticed that stoppages from naphthaline only occurred in my smallest services, and this repeatedly in some cases; and the evil has been cured by replacing them with larger ones. I have thus largely dispensed with the use of the service cleaner; and I hope in time to dispense entirely with this costly and wasteful means of keeping up a consumer's supply of gas.

In connection with this subject I give you some working statistics of the Company which I represent—the first of which (Table I.) is a record of the stopped services which have occurred in their district during the last 8 years. This is interesting as showing that we are liable to have these stoppages throughout the year, but more especially during the last three months of the year. Table II. is a statement of the make, sale, and loss of gas during these 8 years. This and the previous table show that stopped services do increase with an increased yield of gas per ton of coal; but their greatly diminished number in the last year also shows that it is possible to remedy the evil in the way set forth in this paper.

It should be noted, however, that the large make of gas here shown is not the result of high heats so much as of the regular and even charges of coal which are obtained by the use of West's charging apparatus. The furnaces are direct firing, and the heats are moderate but uniform. This table, with Table III., which is a statement of the mains and meters in use this year and those in use eight years ago, shows that the renewal of this plant has been accomplished with a gradual reduction of unaccounted-for gas to the low figure of 2.41 per cent. of the gas made. I might also add that I consider there is a further margin for the reduction of unaccounted-for gas so long as there are any small old mains and services left in use.

The details of main and service laying I have not gone into, as these are matters which have often been discussed before; but I might say that I use water pipes only for mains—the joints being made with lead. The best steam tubing is used for all services. The district is supplied at the works with a gas pressure of 15-10ths during the day and 25-10ths at night. It need hardly be said that stoppage of leaks from mains, services, and meters takes precedence of all other work in the district. The fracture of mains by steam-roller and traction engine traffic used to be of frequent occurrence; but the renewal of the small old mains with larger ones, laid at a greater depth, has greatly diminished this sort of leakage. Some years ago I did what, on account of the large number of gas cookers and engines now in use, it would be difficult to do now—that is, tested all the suburban mains for soundness. I was rewarded by finding a good deal of leakage from the joints of one of them. More recently, when the side paths of the principal streets were repaved with granolithic paving (which has since made all the mains and services in these streets practically inaccessible), the opportunity was taken to renew most of the services with larger ones.

In conclusion, I might remark that it is now 13 years since M. Bremond, of the Versailles gas works, conclusively proved that the formation of naphthaline in mains and services could be prevented by desiccating the gas before it left the works; but I have not heard of this being

TABLE I.—*Stopped Services.*

| Year. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | March. | April. | May. | June. | Total for Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1883 | 4 | 4 | 5 | 5 | 47 | 39 | 11 | 2 | 15 | 11 | 9 | 4 | 156 |
| 1884 | 4 | 4 | 5 | 5 | 19 | 17 | 2 | ..... | ..... | 1 | 1 | 1 | 59 |
| 1885 | ..... | 2 | 1 | 12 | 21 | 9 | 6 | 2 | 4 | 2 | ..... | 5 | 65 |
| 1886 | 4 | 3 | 6 | 1 | 5 | 9 | 3 | 1 | 1 | 3 | 8 | 4 | 48 |
| 1887 | 3 | ..... | ..... | 2 | 8 | 8 | 3 | 2 | 4 | 2 | 4 | 11 | 47 |
| 1888 | 10 | 2 | ..... | 32 | 35 | 13 | 6 | 8 | 6 | 7 | 3 | ..... | 122 |
| 1889 | 2 | 2 | 1 | 68 | 16 | 56 | 11 | 15 | 4 | 2 | 14 | 11 | 202 |
| 1890 | 8 | 1 | 4 | ..... | 4 | 38 | 3 | 7 | 1 | 8 | 8 | ..... | 82 |
| Totals | 35 | 18 | 22 | 125 | 155 | 189 | 45 | 37 | 35 | 36 | 47 | 36 | — |

TABLE II.—*Make, Sale, and Loss of Gas per Ton of Coal.*

| Year. | Make per Ton. | Sale per Ton. | Loss per Ton. | Loss. |
|---|---|---|---|---|
| 1883 | 10,190 cubic feet. | 9,378 cubic feet. | 578 cubic feet. | 5.68 per cent. |
| 1884 | 10,283 " | 9,560 " | 489 " | 4.76 " |
| 1885 | 10,553 " | 10,002 " | 356 " | 3.37 " |
| 1886 | 10,376 " | 9,874 " | 281 " | 2.72 " |
| 1887 | 10,379 " | 9,872 " | 325 " | 3.13 " |
| 1888 | 10,807 " | 10,298 " | 337 " | 3.12 " |
| 1889 | 11,083 " | 10,619 " | 277 " | 2.49 " |
| 1890 | 11,122 " | 10,650 " | 267 " | 2.41 " |

TABLE III.—*Distributing Plant.*

| Size of Main. | Yards in Use, 1883. | Yards in Use, 1890. | Size of Meter. | Number in Use, 1883. | Number in Use, 1890. |
|---|---|---|---|---|---|
| 2 inch | 11,176 | 6,610 | 3 lights | 1,239 | 1,236 |
| 3 " | 6,385 | 8,035 | 5 " | 482 | 639 |
| 4 " | 10,105 | 17,059 | 10 " | 305 | 335 |
| 6 " | 6,760 | 8,171 | 20 " | 125 | 149 |
| 8 " | 1,648 | 1,648 | 30 " | 43 | 51 |
| 10 " | 108 | 396 | 50 " | 30 | 41 |
| 12 " | 1,340 | 1,340 | 80 " | 12 | 22 |
| 15 " | 180 | 180 | 100 " | 6 | 6 |
| 18 " | 490 | 490 | 150 to 250 lights | 2 | 3 |
| | | | Private | 28 | 47 |
| Totals | 38,192 | 43,929 | Totals | 2,272 | 2,529 |

done at any works in this country, and must therefore conclude that the plan is not practicable with us. A large colonial gas undertaking recently tried, by passing the gas through a large condenser after it left the gasholders, to prevent the formation of naphthaline, which at certain seasons of the year caused stopped services to a most serious extent; but I believe this plan has not met with any success. More recently we have heard that the carbureting of gas with oil has not only the desired effect of enriching the gas, but has also prevented the formation of naphthaline, and even dissolved the existing naphthaline in the mains and services. This has, I believe, been proved to be the case at one or two works in London. This last plan looks like an improvement on the one adopted by some engineers, of putting an extra quantity of cannel in their retorts when they have a glut of stopped services. I am myself so strongly of opinion that the only permanent cure for stopped services is by renewing them, that some time ago I asked for, and readily obtained, the consent of my Directors to replace them with larger ones free of charge to the consumers.

*Discussion.*

The President said the subject of the paper was one in which the members were all interested, and he trusted they would have a valuable discussion. The question of naphthaline was ever with them, and they all experienced difficulty with it. If any of the members had, like Mr. Smythe, found a cure for this troublesome substance, those present would be very glad to hear of it. He suggested that perhaps Mr. Livesey could give the members some information as to whether, when oil was used to enrich gas, it dissolved the naphthaline.

Mr. Frank Livesey (London) said the quantity of vapor required to enrich gas was not sufficient to dissolve naphthaline. He had made an experiment which proved this. He had a 30-inch gas main in which was a plate glass window. This was watched nearly every day; and when it was coated with naphthaline—as it often was, to the extent of 3 inches—they dropped some gasoline in. This did not fall straight down, as it was carried along a little by the current of gas; but where it did drop, it dissolved naphthaline for the space of about a foot. Beyond this it practically did nothing. Though there was a very large quantity of gasoline employed for enriching the gas, this showed that they would have to use considerably more to deal with the naphthaline, and therefore it would become very expensive. Mr. Smythe had referred to the French process of desiccating gas, and there was no doubt that there was a great deal in it. If they could take the moisture out of gas, they would keep the naphthaline in it—that was to say, when condensation of the water in the gas took place, then the naphthaline was deposited. If they could prevent the water condensing out of the gas, he believed the naphthaline would go on and burn. The difficulty was that, with certain kinds of coal, with certain heats, and with irregularities in charging, naphthaline would be produced, and the question was, how to keep it in the gas, and prevent it depositing. He noticed by the tables that Mr. Smythe had a somewhat similar experience to himself in the first cold month of the year. In the line referring to 1889, it would be seen that the highest number of stoppages in services occurred in the month of October—that was, when the cold weather set in. With regard to this question of naphthaline, he had an instance which might be mentioned. At Rotherhithe they had a main which ran underneath one of the dock entrances, and up the other side to a meter which supplied the dock. This meter was nearly always choked with naphthaline. He imagined in winter time, underneath the dock entrance, the temperature would not go down much below 40°, and then the gas would pass on into a temperature of perhaps 32° or lower. This caused the condensation of the naphthaline—the water of the gas was condensed, and at the same time the naphthaline deposited.

The President—Mr. Smythe says with larger services stoppages will be prevented.

Mr. Livesey—Where is he going to draw the line? Why not go on to 3-inch services? I have known a 10-inch main in a district to be blocked up.

Mr. J. Methven (Nine Elms) said they had to congratulate Mr. Smythe upon the results he had achieved at Maidstone. As far as the tables were concerned, there was no doubt whatever that the systematic method he

had adopted of enlarging his mains and services had contributed to a diminution of the number of stopped services in the district. On thinking over this matter, it brought back to his recollection—indeed Mr. Smythe mentioned the matter himself—the experiments of M. Bremond on desiccating gas. Mr. Smythe had really desiccated his gas by enlarging his services. He had given the gas a slower rate of travel, and greater facilities for depositing water; and this was one of the reasons why he had met with so much success—in fact, at the point of consumption, the gas was absolutely drier than it would be in a town provided with smaller mains, where the gas had to travel at a greater velocity. Another thing, he worked at a lower pressure in his mains than some of them did. In his (Mr. Methven's) own experience, they worked, at full lighting time, at between 4 and 5 inches pressure. He did not know really that working at a low pressure would facilitate the deposition of moisture; but he felt pretty certain that, the slower the gas travelled in the arterial mains, the more water it was likely to throw down.

Mr. W. Syms (Rochester) said he had tried a little experiment with gas, which proved that drying it was a perfect remedy for the deposition of naphthaline. A few years ago a new post office was erected at Rochester, and in the front of it were two ornamental lamps, which were to be supplied as part of the public lighting of the city. The people did not like the gas pipes to run up the outside of the building, and so they were carried into the basement, up the inside of the office, and out through the fresh, green brickwork of the wall. The lamps, however, did not burn many nights before there was a stoppage. They were cleared out, and then he thought of the desiccating principle. A couple of tin boxes were made by way of experiment, and one of them was filled with dry unslaked lime, and the other with freshly calcined chloride of calcium. These appeared to answer the purpose perfectly well; but, in the course of a few weeks, the lime fell down in a fine powder and stopped the flow of gas, so that he adopted the chloride of calcium in both boxes. One of the most troublesome mains he had to deal with was an 8 inch one, 3 miles long; and they had frequently to open it to clear out the naphthaline. He thought this showed that the size of the pipes was not much protection to them.

Mr. Charles Gandon (Lower Sydendam) said that, whenever he heard this question of naphthaline mentioned, he always sat and listened with great interest, in the hope of finding that they had at last discovered a remedy for it; but unfortunately they had not yet reached that happy position. His experience of naphthaline was precisely what Mr. Smythe had stated, and what Mr. Livesey had pointed out—that it occurred just at the commencement of the cold weather. In October this year, they had a very large number of complaints of naphthaline—more than ever before, though they had not been working differently in any way. As to the solubility of naphthaline, he had not been able to find anything to effectually prevent or remove it. During the past summer one of the scrubbers at his works was practically stopped up with naphthaline. They pumped petroleum spirit of two or three qualities into a boiler, and forced the vapor from it with steam into the scrubber. About two barrels of petroleum were used; but when he looked into the scrubber he found it was in the same condition as when he commenced. He tried sending a different sort of vapor and steam through pipes to the naphthaline; but it remained there almost intact. Therefore he did not think that this was a cure; and he believed that the idea of M. Bremond of drying the gas would be the best remedy they could apply—if it could be applied. There were different ideas as to how naphthaline accumulated. Some said it accumulated in exposed pipes; and Mr. Livesey had illustrated it by the pipe under the dock entrance. But he could say that in the case of his own house, the supply pipes ran round two sides and the back of the premises, and were entirely exposed; and yet, for the last 14 years, they had never been choked. They were, he believed, 1¼-inch pipes; and the number of burners he had was not considerable. Large mains and services were certainly a slight improvement; but they did not keep entirely free from stoppages.

Mr. Norton H. Humphrys (Salisbury) asked Mr. Smythe as to whether he noticed any connection between his stopped services and the quantity of liquid coming from the syphons. The question of the condensation of moisture and the deposition of naphthaline was very interesting, and he thought that, if what had been stated was the case, at the time when there was a stoppage by naphthaline, there should be a greater quantity of water coming from the syphons. In the southwest of England they enjoyed comparative immunity from naphthaline—that was, where they used Somerset coal; but at most of those places where they were not troubled with naphthaline they had very little moisture deposited in the syphons. At Salisbury they never had water or naphthaline in the syphons; and he could mention three or four other works where there never was any, or practically no moisture in the syphons. If there was that connection which had been pointed out between naphthaline and moisture, it ought to show itself in the quantity of liquid taken from the syphons.

Mr. J. W. Helps (Croydon) said, in common with Mr. Gandon (his district adjoining that of the Crystal Palace Gas Company), he had had a great deal of trouble with naphthaline. Mr. Smythe appeared to think that enlarging the pipes would be a practical and permanent cure for stoppages by naphthaline, and thought that the friction of the gas passing through small pipes was one of the reasons for its deposition. Very lately he (Mr. Helps) had had a stoppage in a 6 inch main, which conveyed gas to one of the outlying districts where very little gas was used. This 6-inch main would bear practically the same proportion, according to the amount of gas passing through it, that a 2-inch service had to a house using a dozen lights. This main was often choked up; and he observed that it became blocked underneath a railway arch where cold winds and draughts would cause it at times to be subjected to great variations of temperature. Part of this arch was covered with galvanized iron sheeting; and from this there was a pipe which carried water to just where the gas main ran, and the cooling of the latter by the water falling upon it had no doubt a great deal to do with the deposition of the naphthaline. Mr. Gandon had told them how he had tried to remove naphthaline from a scrubber by passing hydrocarbon vapor into it in conjunction with steam. He (Mr. Helps) had had much trouble with a gasholder outlet; and he had tried among other things, to remedy it by means of steam and naphtha vapor, but it would not answer. Then he tried benzole vapor without steam; and he found it did a great deal more good than when used with steam. Did not this rather point to and form a proof of the statement which had been made that the condensation of the moisture caused the deposition of the naphthaline? When the steam was used with the hydrocarbon vapor, the former condensed; and instead of resulting in any clearance of the naphthaline, he should not be surprised if it did not cause a larger quantity to form. If Mr. Gandon had used vapor without the steam in his scrubber, he believed much more improvement would have accrued.

Mr. W. E. Price (Hampton Wick) said with reference to what Mr. Helps had observed in regard to the outlet of one of his gasholders, he had himself been troubled, during the past year or two, in the same way, both with the inlet and outlet pipes. In the inlet to the gasholder he had found steam to be very successful in removing stoppages; but in the outlet it had no effect whatever. He noticed this again not many weeks ago, when he steamed an outlet for five hours, and after that time there was no difference whatever in the pressure—it was just as low; but the inlet he had steamed clear in about half an hour. He had known the pressure to drop as much as from 7-10ths to 8-tenths; and he generally steamed for about 8 hours before the stoppage would disappear. The secret, he believed, was this—that if they were steaming the inlet of a gasholder they had the gas passing in with it, and the gas was rather warmer than the steam; but with the outlet, where no gas was going out or in, steam had no effect. He had been able to free the outlet by passing gas with the steam.

Mr. C. C. Carpenter (Vauxhall) said that he made naphthaline as a by-product. (Laughter.) He produced from 30 to 40 tons a year and sold it. Some imagined that naphthaline had a great deal to do with condensation. But he had one retort house the gas from which passed across a bridge into a coaling floor where there was simply a row of windows, and then into a horizontal condenser. Now, they had great trouble with naphthaline in this condenser; but there was no sudden cooling there at all—showing that it was not sudden condensation which produced naphthaline. They had naphthaline all through the works; and it was from two mains leading from a gasholder, and running for about ¾ mile, that he obtained the 30 to 40 tons of naphthaline annually. The greater disadvantage of naphthaline was touched upon by Mr. Smythe in his paper. They were feeling very keenly now the competition from electricity and oil. As he had said, on a previous occasion, he had this constant experience—of seeing at night time on his way home some shop or house with electric lighting which had not got it the night before. If they put this fact on the one side, and the continual complaints from gas consumers on the other, he thought they would see they were face to face with a very serious question. Indeed, it was more important now that gas managers should sell their gas, and satisfy the consumers' requirements, than to potter about with a lot of theoretical conditions of working on the works themselves—it was far more important to satisfy their consumers first, and give them plenty of gas and light. He was afraid, in the case of some of the larger works, this had not been carried out so much as it should have been. He also remarked that he was an advocate of high-power lamps, of which they had fixed several on Vauxhall Bridge. After being alight for four or

five days—sometimes for a fortnight—the supply would become very defective, owing to naphthaline. The man who found the cause of naphthaline, and succeeded in getting rid of it would, he added, be a great benefactor to gas managers.

Mr. S. W. Durkin (Southampton) observed that naphthaline, like the poor, was always with us. It was an old enemy of his, and he had spoken a good deal about it, and wished he could introduce a method of getting free from it. He might say that exposed pipes sometimes kept very clear of naphthaline. He had a case in mind, where he had a 9-inch main going over a bridge, and he never had a trace of naphthaline in that pipe; but at the entrance to the bridge, where the pipe passed through damp soil, naphthaline accumulated. After it passed over the bridge and the pipe entered damp soil again, naphthaline appeared; but on the bridge there was never a speck to be found. With regard to service pipes, he had no doubt that larger ones would get over the difficulty for a period; but he was afraid that, in process of time, they would become choked. At Southampton he had four mains leading up into the town, and just at certain points they always had a deposition of naphthaline. One was a 12-inch main, and this they only cleared out a few days before, when it was found coated about 1½ inches thick round the inside. This was all thoroughly cleaned out. He did not care about using steam for clearing the pipes; but he took a main off and washed the naphthaline out with a fire hose. He also referred to a stoppage he had in the inlet of a gasholder. They sent a jet of water into the inlet pipe from the crown of the holder, and washed some of the naphthaline down into a syphon. This, however, only partially removed it. With regard to Mr. Smythe's tables, No. 1 showed that in October, 1888, there were 32 choked services; and in October, 1889, 68. They would invariably find this was the case that when they had for a time glorious, sunny weather and very cold nights, complaints of stoppages would always arise.

Mr. D. Ford Goddard (Ipswich) said that, discussing this question of naphthaline, was something like saying "them's my sentiments." (Laughter.) They continued repeating their experiences without dealing with the cause. The question to which they might call their attention was, What is really the cause of the formation of naphthaline? Of course, although every gas engineer at times was troubled with naphthaline in parts of his plant or distribution system, there were some who, no doubt, were wonderfully free from it—some would go on for years without suffering seriously from it; while others were considerably troubled, like Mr. Carpenter, who had to take from 30 to 40 tons of this substance from his mains in the course of a year. There must be some explanation of this. Was it to be found in the coal that was used or in the heats that were employed? Some thought it was accounted for by the temperature in different localities; but as there were those who had spoken from the South, and they knew of managers who were troubled in the same way in the North, that could not be the reason. He considered the question was one upon which it would be well for the Association to institute a series of experiments. He fancied that they often failed in their experiments because each one made them in his own way; and there was no particular point at which they could compare. If a series of experiments could be made on the same lines, and with the object of finding out why there was this large quantity of naphthaline in certain places and under certain conditions, they would be in a much better position to deal with it, and probably do away with it. He was afraid they would not do much good by relating particular experience and speaking of the evils of naphthaline. Mr. Smythe had pointed out the fact that by enlarging his service pipes he had, in a great degree, remedied the effect of naphthaline; but the question occurred to him whether it was not a remedy which would wear itself out. In a few years these large services would be blocked quite as much as the smaller ones though not so rapidly. This was not what he should call a satisfactory remedy of the trouble. The difficulty lay deeper than this, and it was discoverable, if they attacked it from the right point of view. He should like to see the Association investigate the matter, and elicit the cause of the formation of naphthaline, and then they could afterwards deal with the question of its cure.

The President thought the speakers had treated the paper from the naphthaline point of view, and had rather gone away from the general subject, which was a very interesting one. Mr. Smythe's tables certainly showed that by enlarging his mains and services he had minimized the trouble from naphthaline. Mr. Goddard had pointed out that an experiment might do a great deal in finding out the cause of the formation of naphthaline; but Mr. Smythe had shown that he had successfully done what very few of them could claim to have accomplished in any other way. He thought the paper and tables would bear looking into, and that the members would profit by their having been brought before them.

Mr. Smythe, in replying upon the discussion, said that he would not attempt to answer all the speakers; but he would merely make a few remarks as they occurred to him. As to naphthaline, he felt that his experience differed very much from that of others. Nevertheless there was the fact that he had only naphthaline stoppages in services, and that he had met the difficulty by enlarging them. No doubt these services, in course of time, would require to be enlarged again; and the reason was evident to him. In Maidstone his consumption increased very rapidly—not from an increase in consumers, but from the increase of individual consumption. What did this mean? That the services which they, in the first place, put in to most of the consumers' houses were intended for a small consumption. Now they were consuming from 3 to 5 times more gas, by requiring more illumination, and using cooking and heating stoves; and this meant a large increase in the friction in the pipes. This was not an original idea of his. In "King's Treatise on Coal Gas," it was stated that this would cause naphthaline; and M. Bremond mentioned it—in fact, he went further, and said it was not the friction, but the heat produced a chemical reaction in the gas which formed the naphthaline. As to the size of pipes, his experience did not justify him in speaking of stoppages in mains, as he had not had a single one. With regard to Mr. Humphrys' remarks, he (Mr. Smythe) could not tell the quantity of liquid taken from his syphons; but he knew a great deal of naphthaline came from them. Of course, he was aware that temperature, as well as friction, played an important part in the formation of naphthaline.

On the motion of the President, seconded by Mr. J. L. Chapman (Harrow), a hearty vote of thanks was passed to Mr. Smythe, which he suitably acknowledged.

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Since the meeting Mr. Smythe forwarded to the *Journal* the following additional remarks on the discussion:

The discussion showed that the prevention of naphthaline deposits was a "burning question" with many of the members present; but this was apparently on account of deposits in the mains (both works and district), and not in the services. However, not having any trouble in that way myself, I discussed the subject chiefly as it affected services, of stoppages in which my paper showed I have had considerable experience, and which are well known to occur in some districts by the hundred, and I believe even by the thousand, although, curiously enough, none of the speakers referred to this. I think Mr. Goddard's suggestion, that the cause and cure of naphthaline deposits should form a subject of investigation by the Association, is a good one, and I hope to see them take it up. I consider that inquiry need only be made into the practicability of desiccating gas, and of retaining it in this condition up to the point of combustion, since M. Bremond's experiments have conclusively proved that moisture in the gas is the original cause of the formation of naphthaline; change of temperature being the secondary cause. It does not require any stretch of the imagination to believe in the improvement in quality claimed for desiccated gas. Its retention of the rich hydrocarbon which we call naphthaline, and which with ordinary gas is thrown down at every change of temperature to which it is subjected, would easily account for this. I had hoped that the subject of unaccounted-for gas would have led to some discussion—that, in fact, some member or members would have claimed to have made a better record than mine in this respect, and would have told us how it was done. I claim to have done it in my case principally by renewals of mains and services; and, secondly, by renewals of meters. The unaccounted-for gas of several large undertakings has this year been recorded at a very low figure, notably at Leicester and Carlisle, which are both less than 3 per cent.; and 3.67 per cent. is the figure for nearly the largest provincial gas undertaking in the kingdom, viz., that at Manchester.

## The Newell Oxy-Hydrocarbon Process.

By Mr. J. J. Newell.

The use of oil to generate a high candle power illuminating gas, has become a fixed fact, and where a certain percentage of oxygen is added in carbonizing the oil, it increases very materially the candle power which is obtained by this process. The cost is in favor of the oxy-hydrocarbon process, as the gas can be made and delivered in the gasholder at a cost of 60 cents per 1,000 cubic feet, for a 50 candle power gas. A plant capable of delivering 50,000 cubic feet in 24 hours, would consist of a furnace containing 4 cast iron retorts, 9 feet in length, 3 of them lying side by side, on the bottom of the furnace, over the fire box, the fourth being directly above the 3 within the arch. The upper retort has double the dimension of either of the others, which gives the vapor within the opportunity of expansion, it being kept hotter than the oth

ers. There is an outside retort, or vaporizer, of wrought iron, 9 feet long, where the oil, steam and air enter simultaneously at one end. There the injector is placed. In passing through this semi-hot retort the entering material is vaporized, and from the back end it is connected with a 2½-inch connection to the hot retort, and the connections are 3 inches from one retort to the other. Outside of the furnace the 3-inch connections have crosses with plugs instead of elbows. The interior of the retorts can be examined. The upper retort is 16 inches in diameter, inside. The combined square feet of surface within the retorts is 98 feet, without the connections.

The oil, steam and air become perfectly vaporized before entering the heated retorts, and the residuum is drawn from the vaporizer in a liquid state. On each side of the fire box of the furnace is a coil of pipe for superheating the steam, the combined length of which is 160 feet. This is to superheat the steam before it enters the vaporizer. The oil required for 1,000 cubic feet of gas made by this process is 1 gallon to each 5-candle power gas. For instance, a 30-candle gas is obtained from 6 gallons of Bradford oil. The addition of oxygen by this method gives an additional candle power. The furnace can be kept at a proper temperature for the retorts with 20 bushels of coke for 24 hours. The fuel required to generate the steam would not be more than half the amount consumed in the furnace. The gas when it leaves the retorts enters a washer, from there to coolers and purifiers. Oil gas well purified will increase the candle power from 3 to 5 candles.

As a gas for compression, where it requires to be transported, as for railway lighting and other similar purposes, it is one of the best on account of the small amount of condensation, and is subjected to a much smaller loss of candle power by being compressed, in that it is one of the most thoroughly fixed of fixed gases.

As the question has been asked, how can the gas companies make this process profitable or practical? I would say all coal or water gas companies wishing to improve the candle power of their output to any candle power desired by them, would find it to their interest to make a thorough investigation of the oxy-hydrocarbon process, as this gas is much drier than other gases, and amalgamates most readily with moister gases.

## The Preservation of Timber.

A writer in *Engineering* says that in countries where timber is cheap, labor expensive, and money scarce, it does not pay to apply preservative substances to wood to delay or prevent its natural decay. A very rapid calculation will show that wages, cost of chemicals and compound interest together, represent a sum greater than the cost of frequent renewals. However, the wastefulness of settlers in new countries and the steady accumulation of capital in the old ones, is rapidly doing away with this condition of affairs. Timber is growing both scarce and dear, while increased means of communication have reduced wages in places formerly on the outskirts of civilization. Even in America, where timber was once so plentiful that care was not even exercised to cut it at a period of the year when it was least filled with sap, and when "seasoning" was never thought of in the hurry of railway construction, considerable attention is now being given to preservative processes. Unfortunately the desire to carry them out cheaply has often brought them into discredit. Homœopathic quantities of antiseptics have been not unfrequently used, the action being confined to the outside of the timber, and being quickly dissipated by the action of air and moisture.

In looking over the history of attempts at prolonging the life of timber, we come across some curious expedients.

In 1836, Dr. Bouchorie, a French chemist, tried to impregnate timber by vital suction, that is, he tapped the tree and allowed the ascending sap to carry up a preserving solution. This, however, did not give satisfactory results, and in place of it a cap was supplied to the end of a newly-cut log, and the solution forced along the sap ducts by hydraulic pressure. Sulphate of copper was the chemical used, and when it was applied to newly-felled timber it gave good results. Lime water has been tried, and also salt, but the effects have not repaid the trouble. There is a strip of road in the Union Pacific Railroad, in Wyoming Territory, where the sleepers do not decay at all. The analysis of the soil shows that it contains sodium, potassium chloride, calcium, and iron, which act as preserving agents. An inventor named Foreman brought out a process by which dry arsenic and corrosive sublimate were inserted in holes in sleepers, and covered with plugs. The materials became dissolved and effloresced on the surface, when the cattle licked them and died by scores. The farmers rose in arms and forced the railroad company to burn all the sleepers. Many other attempts might be narrated indeed the entire list of antiseptic substances appear to have been ransacked to find something both cheap and effective.

The chief processes that have been employed for the preservation of timber are kyanising, burnetising, and creosoting, that is, impregnation with bichloride of mercury, with sulphate of zinc, and with creosote. Many others have been proposed and tried, but only these three have survived. The first seems to be well adapted for bridges, or for timber exposed to weather alone, and not to constant moisture. Examples have been found in America which were in a good state of preservation after 28 years' exposure. But when kyanised timber has been used for railway sleepers and pavements it has had only a doubtful success, probably in consequence of the washing out of the corrosive sublimate. The wood is allowed to steep one day for each inch in thickness of its least dimension, and one or two days in addition. The solution contains 1 per cent. by weight of corrosive sublimate, and from 4 lbs. to 5 lbs. of this are absorbed per 1,000 ft. b. m. Burnettising may be performed in the same way, sulphate of zinc being the chemical employed, but it is usual to steam the timber first to open the pores, and then to subject it to a vacuum to withdraw the sap. If this be not done the timber must be stored for a considerable time to allow it to dry naturally. When treated the wood should not be placed in exposed situations, such as bridges, or else the zinc will be washed out and leave it unprotected. This is particularly true when weak solutions are used, and when the potency is greatly increased the tenacity of the timber is impaired. In Germany 1.91 per cent. is considered the proper strength for railway sleepers. Several suggestions have been made to confine the zinc in the timber; Mr. W. Thelmany proposed to subject the timber to a subsequent bath of chloride of barium, with the view of producing an insoluble sulphate of baryta. It is doubtful, however, if the reaction would go on in the minute sap ducts of the wood. Another process is that of Mr. Wellhouse, who also employs a double solution, the first being chloride of zinc to which a little glue is added, and the second a solution of tannin. It is claimed that the latter upon coming in contact with the glue forms small particles or films of artificial leather which plug up the mouth of the sap ducts and prevent the zinc being washed out. Certain experiments seems to confirm the idea. Another plan consists in using a solution of chloride of zinc and gypsum. The gypsum crystallises and hardens inside the sap ducts, and forms partitions to hold the zinc within the cells. There are three burnettising works in the States, and the cost of the process is about $5 per 1,000 ft., board measure, or 20 cents to 25 cents a sleeper.

Creosoting is so well understood that it scarcely needs description. It is in almost universal use for sleepers for English railways, and no other process has been commercially proved capable of resisting the *teredo navalis* and *limnoria tenebrans*. Here and in Holland 10 lbs. to 12 lbs. of creosote oil per cubic foot of timber are found sufficient for harbor purposes; the French use 19 lbs. for the same purpose, and a similar quantity has been found necessary in the Gulf of Mexico, where the marine worms cut off an unprepared pile in eight months. The creosoting process needs to be well done to be effective, and for ordinary purposes 8 lbs. to 12 lbs. are required per cubic foot of timber.

It was generally considered that the presence of heavy oils in the creosote was objectionable, and therefore engineers were accustomed to specify that not more than 10 per cent. should be present. This view has been controverted by others, who take the view that it is only the heavy oil which can be relied upon to exert a continuous preservative action, the creosote itself being liable to become dissipated in course of time. This view receives confirmation by the good results of the preservative process introduced by Mr. Henry Aitken, of Falkirk. This consists simply in soaking timber in melted naphthaline for a period varying from 2 to 12 hours, depending on the bulk of the piece. A temperature of 180° to 200° F. is all that is required for the process, and is most easily obtained by placing steam pipes in the bottom of the tank which contains the material. Simple as the process is, that is not its chief merit. A more valuable feature is that it can be applied to green timber, thus doing away with the long and expensive process of seasoning. The naphthaline makes its way through the pores of the wood, decomposing the albumenoid compounds, and displacing both sap and water. It then becomes fixed, and the whole substance is permeated with solid antiseptic of a permanent character.

Aitken's process was introduced in 1882, and three years afterwards we gave an account of certain trials that had been made to demonstrate its utility. Among these we mentioned the construction of some railway wagons for the North British railway. These were made from logs taken direct from the timber pond and naphthalised. The logs were cut up and worked in the usual way, for unlike cresoting the Aitken process does not render timber more difficult to cut, neither does it interfere with painting nor varnishing. The wagons have, up to the present, shown no sign of decay, and all the joints are tight; when taken apart

the tennons still show the chisel marks, demonstrating that they have not been working in the mortises. On the same railway there were placed sleepers and keys, and after seven years these are still perfectly fresh. One of these keys has been forwarded to us; it is in perfect condition, and does not appear to have been touched since it was first driven. Four years ago fencing slabs of poor Swedish timber, some already beginning to decay, were naphthalised and put down and to-day they are in as good a condition as ever.

In coal pits equally good results have been obtained, and larch timbering, which usually becomes quite rotten in five years, has remained perfectly sound. White ants and the *teredo* do not find naphthaline more palatable than creosote, for samples laid in the harbor of Colombo have been carefully avoided by both pests.

In this country there are only two methods of preserving timber in general use, namely, careful seasoning and creosoting. The latter is only applicable to rough work, such as sleepers, fencing posts, and the like, while the former is expensive, and is only moderately successful in the case of soft timber. It remains to be seen if the Aitken process will take rank with the others and obtain general acceptance. It is full of promise, and if it fulfils only a part of what appears to have been proved for it experimentally, will be a valuable addition to our means of fighting the deteriorating influences of time and weather. For many purposes hard woods are employed simply on account of their great durability, the cheap soft woods being, in other respects, equally well suited. If the soft woods can have their lives prolonged, a great saving can be effected in most cases. The sudden seasoning said to be effected by naphthaline without sensibly hardening the wood or rendering it difficult to work, deserves to be carefully investigated, as it would liberate an immense amount of capital now lying idle, besides preventing the annoyance resulting from the use of half-seasoned timber. Everything that offers to cheapen production is worth trying in these times of fierce international competition.

## The Massachusetts State Commission Denies the Petition of the Worcester Gas Light Company.

The following is the reply made to the petition of the Worcester Gas Light Company, by the State Board of Gas and Electric Light Commissioners, in the respect to proposals of the former to engage in the electric lighting business.

COMMONWEALTH OF MASSACHUSETTS,
BOARD OF GAS AND ELECTRIC LIGHT COMMISSION.

*Petition of the Worcester Gas Light Company.*—This was an application by the Worcester Gas Light Company, under the acts of 1887, chapter 385, for authority to engage in the business of generating and furnishing electricity for light and power in all the territory in which it is authorized to supply gas.

A public hearing was given in Worcester. The petitioner and the Worcester Electric Light Company were represented by counsel, the latter in favor of the petition.

It appeared in evidence that the vote required by statute had been passed by the Gas Company, that it had also voted to purchase the property of the Electric Light Company, and that the latter had voted to sell all of its property, rights and franchises to the former.

Counsel for the petitioner, at the hearing, informed the Board that it was the understanding between the Companies that the Gas Company should take all the stock of the Electric Company, 2,000 shares, and issue therefor to the latter Company 2,000 shares of stock of the Worcester Gas Light Company.

From the contract of sale which was subsequently submitted it appeared that the Gas Company was to pay to the Electric Company the proceeds of the sale at auction of 2,000 shares of the stock of the former, for the entire property and franchises of the latter, and to assume its debts.

The present capital of the Gas Company is $500,000 and of the Electric Light Company $200,000, and the combined debts considerably exceed $100,000.

It appeared that the market value of the gas stock was about 165, and of the electric not over 140, but little of either being upon market. Very little evidence was introduced, and the petitioners seemed to rest their case chiefly upon the ground that both Companies had voted for the consolidation, and that no one appeared at the hearing to oppose it.

Such reasons the Board has not heretofore regarded as sufficient. In considering one of the earliest cases presented, the petition of the New Bedford Gas Company, it says: "It seems to be the view of the petitioner that the consideration of its request was mostly a formal matter, and upon conforming to the conditions made by law, their request would be granted as a matter of course. Upon a careful review of the situation, and as no effort has been made to show any benefit likely to accrue from the consolidation proposed, there seemed no sufficient reason for granting the prayer of the petitioner."

From observation since that time, the Board has been confirmed in its position. Consolidation is not always or necessarily a benefit; it may or may not be. Its expediency must depend entirely upon local conditions. They alone must determine whether an advantage is to be gained, either by the public or the stockholders; whether, in fact, it may not bring serious injury to all concerned. Such a course may develop activity in the stock of the two concerns, usually increasing its amount or apparent value, and thus give to some an opportunity for profit.

Any such benefit must be for the few only, and cannot be influential in deciding a question of this importance. In cases heretofore acted upon, all have been in small towns, or where special conditions gave substantial promise of some advantage to the Companies or consumers, thereby rendering such a union expedient or necessary. The Board has never before been asked to approve a consolidation in any of the larger cities of the State, and is not aware that it is desired by any other Companies similarly situated. The population of Worcester is about 85,000. There is no city in the United States of equal size in which the lighting is done by a single Company, nor are such combinations generally favored by those best acquainted with the business.

The case presented by the petition is a new one. It is not to be overlooked that the interests of the Companies and consumers have much in common. If a consolidation shall bring increased strength, and a larger measure of prosperity to the corporations, some share in these advantages will be received by the community; but if instead it is to bring weakness, the public is sure to be injured through failure to secure the best service and the lowest rates. The decison of a question of so great importance cannot rest upon the few suggestions made at the hearing.

The Board has therefore endeavored to make a careful study of the two Companies, their history and the local conditions affecting them, and as a part of this work, a thorough examination of the records and accounts of both has been made.

The Electric Light Company was organized early in the year 1884, and has been engaged in business continuously since that time. A large proportion of its business has been, and is to-day, arc lighting. It has just completed the construction and equipment of a plant costing for land, building, appliances and machinery not electric, about $125,000.

The building is of ample size for all probable needs of the city, for some years to come. Every advantage in construction known to the best engineering skill, seems to have been employed, and all appliances rank with the best. It is situated nearly two miles by the nearest traveled road from the gas works, and it is not proposed to change the location of either plant.

From a careful study of its records and accounts, it seems that its affairs have been managed with strict economy; its policy has been conservative, well calculated to give permanence to the investment, and free from speculative features. Its directors include well known and successful business men—men who have been in an especial degree identified with the city's growth and prosperity.

The Board has been unable to find that any appreciable saving in the conduct of its affairs, or in the manufacture of its product, could be secured by the transfer of this business to the Gas Company. There is no article used in common in the manufacture of the two kinds of light; even the coal is different in kind and bought in separate markets.

It appears, from the evidence at the hearing that coke for fuel is available from the gas works only a few weeks in the year, and then to but little extent, and it is probable that any advantage accruing from this would be more than neutralized by the necessity for transporting it between the stations. The wide separation of the two plants which are to remain as they are now, the different training needed, and the large volume of each business, would render necessary separate superintendents and employees.

Either Company is large enough to employ first-class talent to control its affairs, and the best results will be most likely secured by superintendents in each business with a special training therefor.

Although the management of the electric light business has been able and successful, it has not been costly, and it is not probable that this labor could be added to the present burdens of gas management without some additional compensation in the near future.

Since 1884 the business of the Gas Company has greatly advanced, its output in the last three years having increased nearly 50 per cent. The present annual dividends of the Company are 8 per cent., and with the exception of a year and a half have not for many years been below that

rate. The Electric Company's dividends have ranged from 3 to 7 per cent. annually, averaging 5 per cent.

The provisional contract between the two companies and their indebtedness would probably lead to an additional $300,000 to the present capital of the Gas Company, and $100,000 more is not a large estimate for such extension of the incandescent system as is likely to be imperatively demanded.

Probably the stockholders in the Gas Company do not expect to receive reduced dividends in consequence of the consolidation.

But with no facilities for reducing the cost of electric light, how can this rate be maintained on the enlarged capital?

Apparently, either by advancing the prices or lessening the service, or by using the surplus profits of the Gas Company.

Either course is obviously against the public interests; the former would be adopted only with reluctance; the latter ought not to be allowed.

If, on the other hand, the Gas Company does expect and would be satisfied with smaller dividends, why should not the community receive the benefit in a lower price for gas?

It was the duty of the Board three years ago to call attention to the need of large improvements and additions to the works and property of the Gas Company. The extraordinary increase of business since that time has made this much more imperative.

This has been fully appreciated, and much has been already done, and much yet remains to be done. A comprehensive scheme of improvements has been entered upon, and, in the interests of the Company and consumers, ought to be pursued.

In the opinion of the Board there will be ample demand for the expenditure of any surplus, in adding strength to the corporation and securing to the consumers of gas that improvement in service and reduction in price to which they will be properly entitled. It is not to be forgotten that the primary purpose of incorporation is profit. This impels the management to such a course as will make that profit as great as possible; the same end is sought in consolidation. The desired income would not be sought, however, in this case, and in the present condition of the two Companies, in the direction of electrical development; nor is there any well founded prospect that it would be in the near future.

It would be for the immediate interests of the Consolidated Company to increase the sale of gas rather than of the electric light. If it did develop and push the electric light, it would be with reluctance, by reason of the expenditure required and when the demand was so imperative that it could not be refused.

Such a course could not long be satisfactory to a community of the size and character of Worcester. Experience shows that it would arouse and encourage, although it might not justify, the demand for a competing lighting Company, or for the assumption, by public authority, of the business. Although either course might bring on serious injuries, these might seem to the public mind to be more easily endured.

In this case the field for each Company is ample. Each has been successful, and is likely to so continue, with proper management.

It is admitted that thus far there had practically been no competition between the two Companies. Light has sometimes been supplied below cost or without profit in other places, in order to compel a combination of companies. If, however, it is understood that these corporations are to remain separate, the management will not have this inducement to indulge in a needless waste of capital. Only a wholesome rivalry may be expected.

The Board can see no valid reason why, pursuing their separate courses, the two companies will not be able to supply their respective customers with lights of as good quality, and at as low prices as the same service is performed elsewhere, under the same conditions, or could be here, after consolidation.

For the reasons stated the Board deems it for the best interests of all concerned, both consumers and stockholders, that the consolidation should not take place as requested.

The petition is therefore dismissed.

For the Board, A. B. COFFIN, Chairman.

## A Novel Form of Flexible Tubing.

At the Richmond meeting of the American Society of Mechanical Engineers, Mr. T. R. Almond, of this city, brought to the notice of his associates a novel and improved form of flexible tubing. Mr. Almond said:

It seemed to me at first rather a wild kind of an idea to make a metallic tube which would be quite flexible, and which could be used for conveying illuminating gas. I have, however, after many experiments, succeeded not only in making a flexible tube for such purposes, but also one which will convey gases, steam, or liquids under considerable pressure. This tube has sufficient flexibility for all practical purposes, with the additional advantages of great strength and durability.

When a tube is formed by coiling a wire around a mandrel, the convolutions may be made to press upon each other with considerable force, and the joint formed at the point of contact of the individual convolutions will be tight in proportion to the amount of pressure exerted. If such a tube be bent, the joints will be broken all around the coils except at one point, and therefore, when bent, it is useless for conveying liquids or gases.

Wishing to utilize the peculiar flexibility of spiral spring tubing for the conveyance of gases in cases where a flexible tube is required, I conceived the idea of interposing a triangular shaped wire between the coils of a round wire. When a tube so constructed is bent, the convolutions of the triangular coil adjust themselves to the spaces between the round coils, as shown in Fig. 1. The triangular wire is pressed between the coils of the round wire, during the process of constructing the tube, with

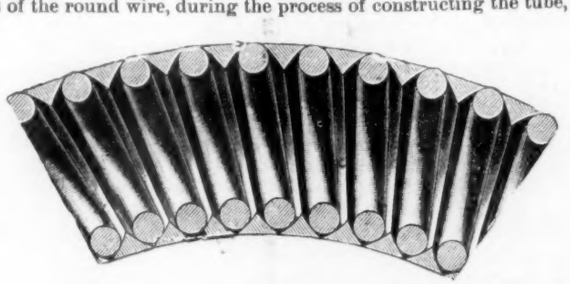

Fig. 1.

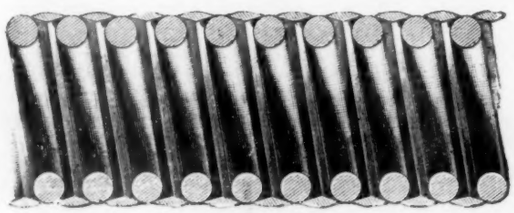

Fig. 2.

Fig. 3.

sufficient force to spread them apart, so that the contact surfaces are at all times under pressure. The triangular wire serves two purposes—one is to spread the coils apart, so that the pressure will be exerted on the contact surfaces; the other, to fill the irregularly shaped spaces between the coils of round wire, adjusting itself to the changing form of the spaces due to any given flexion. This pressure brings into play the element of friction to such an extent as partly to destroy the flexibility of the tube, which, when bent, will retain the form given to it. This was an unlooked for and unexpected quality.

As the primary object was to obtain a flexible tube, trials were made with wire having a more obtuse angle. Such is shown in Fig. 2. This gave better results, as a more perfect joint was produced with less tension of the inner coil, and the friction became correspondingly less, the result being a tight tube with sufficient flexibility. Fig. 2 also shows the shape of the seats into which the round wires are forced by their tension. The seat for the inner wire is much more obtuse, and on this account the inner wire will not, under a given tension, be forced into such a seat so tightly as in the sharper V in Fig. 2. It will be seen that the degree of flexibility depends upon the amount of tension put upon the inner coil, or the extent to which the convolutions are forced apart. I have produced a perfectly tight tube with two coils of round wire, in which the

outer coil is wound sufficiently tight between the convolutions of the inner coil to spread them apart for the purpose of getting pressure on the joints, substantially the same as with the triangular wire. This makes a very strong tube, but is too bulky for many purposes. Two half round wires, or even less than half round, may be used; or the inner wire may be round, and the outer half round, or much less than half round. The tube will then be less bulky, and, supposing the outer wire to be considerably less than half round, the convexity of its surface may be such as to give results similar to the obtuse triangular wire shown in Fig. 2. I have made several tubes in which the contact surfaces of the coils are made to coincide with a circle whose center is the axis of the tube. The joints so formed are practically a series of ball and sockets joints; such a tube has smoother outer and inner surfaces than those previously described. A serious objection to such a tube is that the wire changes its shape during the process of coiling, so that the joint surfaces will not make sufficiently complete contact, whereas the forms of wire previously mentioned are of simple construction, and the slight change of form which occurs during the process of coiling will not affect the result. The extent to which this tubing may be bent without leakage is considerable: a piece of ¼-inch bore, tied as shown in Fig. 3, has been subjected to a steam pressure of 75 pounds without leakage; the smallest curves of the bent portion corresponded in this case to a circle 2 inches in diameter. I have not yet made any tube larger than 5-16th inch bore, but think it possible to make them as large as 1 inch bore, and strong enough to stand any ordinary steam pressure. For purposes where pressure is not required the tube may be made of sheet metal, and may possibly be made as large as 2 inches in diameter.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Frederic Egner, under date of the 4th inst., writes us to say that the new inclined retort benches at the Laclede works, while doing good work, are not meeting with the previous expectations, and thinks that, all things considered, horizontal retort benches, with stoking machines, are the more desirable for large works, where the machines can be employed. Not only are the benches very expensive, but there seems to be some difficulty in charging slack coal. The inclined retort system is nevertheless going to be thoroughly and fairly tried at the Laclede works this winter.

The following matter from Hamilton, Ohio, is self-explanatory:

City Clerk's Office. J. J. McMahon, Clerk.
Hamilton, Ohio, Nov. 29, 1890.

James R. Smedberg, Esq., Hamilton, Ohio: Dear Sir—Enclosed please find a certified copy of a resolution passed by the City Council of Hamilton, Ohio, at a regular meeting held Wednesday evening, Nov. 26, 1890. It gives me much pleasure to transmit so high a compliment to so worthy a gentleman and scholar, and one who has so well earned it by hard work and faithfulness, and one who is possessed of so high a knowledge of mechanical engineering applicable to the building and operation of gas works and the necessary distributing system. In this I know I but echo the sentiments of the City Council and all good citizens, who appreciate the one great accomplishment—aside from having the best gas works with the most modern appliances—the fact that they were built within the estimate made, a thing rarely accomplished in public improvements. Very respectfully, J. J. McMahon, Clerk.

The resolution referred to in the above as enclosed is appended:

Hamilton, O., Nov. 29, 1890.

At a regular meeting of the City Council, held Wednesday evening, November 26, 1890, the following resolution was adopted:

Be it *Resolved* by the City Council of the City of Hamilton, Ohio, That the City Council cordially recognize the integrity, diligence, and skill which James R. Smedberg, as Engineer-in Chief, has exercised in the design, construction, and completion of the gas works for their municipality; and that the Council hereby extend to him their vote of thanks for his untiring energy devoted to the city's interests, which has resulted in a complete and perfect system of gas manufacture and distribution for the city, constructed within his original estimate of cost.

That a certified copy of this resolution be mailed to Mr. Smedberg.

In 1874 a charter was granted to the incorporators of the Equity Gas Company, the works for which it was proposed to construct and operate in the Eastern District of Brooklyn, N. Y. The enabling act provided construction work should be begun within three years, and in that period barely sufficient work was done to comply with the law. The scheme then hung fire for a number of years, but again became a disturbing factor in 1884, when, on petition of the Williamsburgh Gas Light Company, the Attorney-General of the State commenced proceedings to declare the Equity charter null and void. The usual routine of such cases from court to court was reported, and in January of this year the Attorney-General discontinued the original action and applied for leave to begin proceedings of another character. In July of this year that petition was refused in the court of last resort, whereupon those into whose hands the Equity charter had drifted found themselves unhampered. In the meantime the city authorities of Brooklyn had been unfriendly to the Equity Company, in that under its charter the State gave it permission to open the streets without the consent of the local authority, and the city notified the Company that unless it obtained consent from the former in the regular way to open the streets, its laborers would be treated as trespassers, etc. On Dec. 2 a gang of the Company's workmen, under charge of Foreman W. P. Elliot, attempted to open the ground on Maspeth avenue, with the result that Elliot was arrested on charge of opening a street without a permit. The case now will go through another lengthy legal process, this time with a view to determining whether the Legislature has the right to say whether or not a private corporation can disturb the streets of a city or town without obtaining the consent of the local authority.

The Nationalist Franklin Club, of Cleveland, Ohio, have been amusing themselves (and others) with a discussion of the various municipal reforms that would place Cleveland on the plane of perfect government; and in their "informal talks," of course, the plan of municipal gas and electric light works came in for indorsement. When it was agreed that this scheme should be entered into "for the benefit of the citizens," the Franklinites thereupon adopted the following resolutions, which were ordered forwarded to the City Council:

"*Whereas*, The lighting fund is exhausted and more than exhausted, so that you cannot legally enter into lighting contracts for the coming year; and, whereas, Chicago, by putting in her own lighting plant, is effecting a saving of over 50 per cent. of her expenses for lighting; and whereas, the water works pumping station, the Arcade and numerous other buildings run their own lighting plants, their managers finding this more profitable than to pay a private corporation to light them,

"We, the members of the Franklin Club, citizens of Cleveland, hereby petition your Honorable Body that you provide against a future deficit in the lighting fund by exercising your legal power to put in a lighting and power plant, owned and operated by the city, as Chicago has, and with provisions to furnish private consumers with light and power. By so doing you will shortly be able to light the streets without direct expense to the city from the profit derived from private consumers."

The Selectmen of Beverly, Mass., have refused to permit the Beverly Gas Light Company to erect poles for the purpose of supplying an incandescent electric lighting service in the district known as the Cove.

The Common Council of Port Angeles, Washington, has granted a franchise to Mr. C. R. Mallett, of Victoria, to construct a gas and water works and an electric light plant in that place. The water works portion of the enterprise will probably be taken up first.

The Huntington (Ind.) Gas Company will extend its mains to the adjoining town of Warren.

The business offices of the Little Falls (N. Y.) Gas Light Company are to be removed to the Fleming block on Second street.

The proprietors of the People's (natural) Gas Company have advanced their contract rates for a supply of natural gas for fuel in the sum of 12 per cent. over those in vogue up to the 1st inst., and those who obtain a supply through meters are hereafter to pay 15 cents per 1,000 cubic feet, net.

Mr. John B. Hall, Jr., after several years of active and valuable service in the position of Secretary of the Evansville (Ind.) Gas and Electric Light Company, has resigned that position in order to accept a more lucrative place in one of the most important houses in this country engaged in the business of druggists supplies. He has our hearty congratulations, and we know that he will be successful. Nevertheless, we are sorry at his "going out" from the craft.

A Correspondent at Utica, N. Y., forwards the following: "A good part of the complaint that has been made concerning the destruction of the public electric lamps is the direct result of mischief makers. Early this month, as a result possibly of the offer of $10 reward by the

Company for the arrest and conviction of any one accused of maliciously breaking the lamps, a lad of 14 years of age was arrested for climbing up a pole, at the corner of Howard avenue and James street, and smashing the lamp attached thereto. Conviction followed the arrest, and the culprit was given the alternative of paying a fine of $25, or of spending 25 days in jail. No doubt this will have a restraining effect on the lamp-smashing propensities of the street gamins and hoodlums of the city.

THE Committee on Lamps, Cambridge (Mass.) Board of Alderman, are considering the advisibility of adapting an automatic device for the lighting and extinguishing of the public gas lamps. The Company making the offer proposes to equip 700 lamps with the apparatus, and to charge for the use thereof a rental of $3.50 per year each, the contract to run for 10 years, at the expiration of which period the city is to own the plant. The contracting Company also agrees to keep the apparatus in repair, at the sum named in the rental.

THE Kingston (Canada) Electric Light Company offers to maintain any desired number of high-candle arc public lamps, to be in service 300 nights of each year, at 30 cents per lamp per night, the agreement to be based on a five-year contract.

AN odd case of thieving is reported from Buffalo, N. Y., where John Sibey, a youth of 18 years, was recently arrested for stealing a number of globes from public lamps, of the Boulevard pattern, maintained by the Buffalo Gas Light Company. Gas Inspector Daniel Collins located the offender.

THERE is little reason for supposing that the interests of the Annapolis (Md.) Gas Light Company and the local Electric Light Company will not soon be merged. In fact the negotiations have reached that stage where the Directors to represent the Gas Company in the consolidation have been named in the persons of Messrs. J. H. Brown, J. Wert Randall, Grafton D. Riedout, Edward Powers and J. H. Nichols. The electric interest will have four Directors on the Board.

THE Philadelphia Councils' Finance Committee met recently to consider the estimates of expenses for the coming year submitted respectively by the Departments of Public Works and Public Safety, whose joint demands amount to an aggregate of $13,000,000. Director Wagner, who represented the Department of Public Works, stated that the sum of $9,731,635—an increase of $1,258,966.97 over the appropriation for the current year—would be necessary to carry on the affairs of the Department, and his requisition was reduced but $60,000. The Director put in the estimate for the coming year the salary of the office at $10,000, dating from the expiration of his own term. The present salary is $7,500. He argued that the man who filled the position properly should receive the salary mentioned. In asking for an increase in the number of meter inspectors, the Director said there were now 131,000 meters in the care of the Department, an increase of more than 8,000 over last year. A rather prolonged investigation or explanation of the results of the partial introduction of water gas was indulged in, and the Director gave it as his opinion that a mixture of coal and water gas was preferable to either straight coal or water gas. In reply to the question whether water gas was not more dangerous than coal gas, he said that water gas by inhalation would take life in about 1½ hours, whereas coal gas "would be fatal in about 1¾ hours." The complaints made about bad gas in the city were in 99 per cent. attributable to local causes or defects, either in the service pipes or in the fixtures. The city could now depend on a gas supply each 24 hours of 24,000,000 cubic feet. He recommended that in the very near future a new water gas plant should be erected on the 26th Ward site, and that the manufacture of gas be discontinued at the Market street station, the latter to be used simply as a storage plant, which would enable the city to sell off a large area of valuable real estate.

ON Saturday, November 29th Judge Norton, of Alexandria, Va., granted a charter of incorporation to the Peoples Gas Saving Association, of Baltimore. The Company is capitalized in $10,000, and its officers are: President, Moses Kelley; Vice-President, M. J. Annick; Secretary and Treasurer, C. H. Dickson.

SUPERINTENDENT MCNALLY, of the Negaunee (Mich) Gas Light Company, has just completed many important changes on the manufacturing plant. In fact the Company is now in position to send out treble the quantity of gas that it supplied this time last year.

THE Gas Committee of Philadelphia Councils has agreed to report favorably the ordinance permitting the Philadelphia Gas Improvement Company to rent a portion of the 25th Ward gas plant, the rental for the same to be $5,000 per annum. As Mayor Fitler is said to be in favor of this proposition, it may be taken for granted that the measure is settled.

IN support of Director Wagner's claim that Philadelphia's gas is all that it should be, the following certificate, from Professor N. Wiley Thomas, of Girard College, has been given wide publicity—the report is made under date of December 1st;

"The gas has been examined for hydrogen and sulphide, carbon disulphide, carbon dioxide and ammonia. A very careful search for hydrogen sulphide failed to reveal its presence. It may be worthy of remark, however, that this impurity was present in considerable quantity during the recent trouble. Carbon dioxide was detected; the amount was not excessive; no more, in fact, than has been generally noticed. Ammonia exists only in traces, and may be passed over as unimportant. The gas is now practically in its normal condition, and the impurities found do not indicate that it is not technically pure."

THE Committee on Gas and Light, of the Los Angeles (Cal.) Board of Councils, having investigated a proposed ordinance, that had been referred to them, under which George W. King "and his assigns" proposed to lay gas mains and distribute gas in that city, reported the same back to the Council with the significant amendment attached thereto in the shape of a recommendation that the ordinance should not pass. In the discussion on the disposition of the amendment, several members gave it as their opinion that King's petition appeared to be but another attempt to secure a franchise for trading purposes only. The report of the Committee was adopted—a really healthful sign.

THE amended electric lighting contract for Lincoln, Neb., is as follows: "The arc lights are to be of 2,000-candle power, not to be more than two blocks apart, except outside of the gas district, where they may be placed not to exceed four blocks apart. The number of lights shall not be less than 60, and may be more, at the option of the Mayor and the Lighting Committee. All gas lamps within the territory are to be discontinued during the time said electric lights are in use. The Company agrees to furnish everything necessary, and to keep lamps, etc., in good repair and condition at its own expense. The lamps may be kept burning all night, or one-half the night, as desired, the all-night lights to be not less than 16 in number, and on one circuit. For this the city agrees to pay $10 per month for each all night lamp. The contract is to run for 5 years.

THE Rochester (N. Y.) Power Company has brought suit against the Rochester (N. Y.) Electric Light Company, in which plaintiff demands an injunction restraining defendant from using water power on its premises. The property was purchased by the Company from James M. Whitney, whose title was secured under a deed from William F. Ward, and plaintiff claims that under this deed defendant has no easement. Defendant asserts that the water wheel has always been operated with plaintiff's knowledge and consent, and that if no easement was conveyed in the express terms of the deed there was a mutual understanding that such easement was held. The case will be tried before Judge Rumsey.

THE Board of Public Works, of Des Moines, Ia., would seem to be anxious to place itself in position to answer to the charge of breach of contract, in respect to carrying out the agreement for maintaining the public lighting (mixed system of high power arcs and gas lamps) that was entered into between the city and the Capital City Gas Company in 1888, the life of the contract to be for 5 years. The authorities now claim that the Capital City Company did not live up to the provisions of the agreement, in that the gas lamps displaced by each arc were not up in number to the estimate, hence the Board of Public Works, towards the close of November, advertised for bids for arc and gas lighting. The Des Moines Gas and Water Power Company offered, under the new deal, to supply arcs (2,000-candle power) at the rate of $6 each per month, the Globe Light and Heating Company, of Chicago, offered to supply gasoline lamps for $17.75 each per annum, and the Sun Vapor Street Lighting Company, of Canton, O., proposed to supply lamps of similar kind for $18 each per annum. The Capital City Gas Company made no bid, as it considers (and justly) that the authorities are bound by the existing contract, to the full extent of its original life. Under the contract the Gas Company receives $11.75 per month for each 2,000-candle power arc maintained, hence it requires but very little thought to determine why the authorities are anxious to break faith with the party of the "other part" to the contract. Wriggle as they may, though, the

authorities will have to carry out their part of the agreement—that is, if there is even law in Des Moines.

A PECULIAR action in law is reported from Dubuque, Iowa, under which Mr. J. K. Graves asks for an injunction restraining the Key City Company from discontinuing a supply of gas to his premises. From the affidavits submitted by petitioner the following interesting facts are gleaned: It appears that J. K. Graves, who for some years prior to 1880 was President and chief owner of the Key City works (as near as we can remember, Messrs. Howard & McArthur operated the plant under leasehold in the decade of 1870–80), in the spring of 1880 was made an offer by certain capitalists for the property that he considered was worth entertaining. Mr. Graves finally named $150,000 as proper compensation for his relinquishment of ownership, which amount was deemed rather above the worth of the property by the negotiators. A compromise was eventually reached, and the works were turned over to the bidders at a valuation of $140,000, with the further stipulation that he (Graves) was not to be charged for any gas that he might use in his residence for the ensuing 20 years. The sale was concluded and the agreement was carried out. The new owners elected Mr. John Bell to the Presidency, who in turn was succeeded by Mr. J. H. Lull. When the latter died Mr. Wm. L. Bradley was elected President, and Graves alleges that neither of the latter's predecessors made any objection to, but rather assisted in maintaining, a supply of gas in the Graves residence; in proof whereof he asserts that the Company's Superintendent assisted in equipping the house with fixtures, a gas stove, etc. He insists that at the time the Company agreed to supply him with gas he used a gas log fire in his library, and that the only additions since made to the gas consuming appliances in his house were two burners and a gas cooking stove, all of which were installed under advice of persons connected with the Gas Company. Further, he avers that the cost of the gas supplied to him now by the Company is much less than what it cost the latter to supply it in 1881, although he may possibly use a greater quantity in cubic feet now than he did then. His contract did not specify or limit the quantity that he might consume, and his present use of the vapor is not nor can it in any sense be considered improper or wasteful. Therefore he prays that the Company be enjoined from cutting off a supply of gas, that it be restrained from attempting to collect for gas used in the past, and that it be obliged to carry out its contract with him.

NOT having been favored with a statement as to the reasons that led to the action of the Gas Company in desiring to break the contract—if one of the nature indicated in Graves' complaint existed, and we are inclined to believe that a contract did exist—we will refrain from making any comments on the merits of the case at present, or until we are in receipt of the other side of the story. In the meantime, however, we cannot forbear the remark that the Key City Company, in common with other corporations, will likely find molasses more alluring than vinegar when in the pursuit of a fly whose buzzing and fluttering may incite a desire to render it harmless by reducing it to a condition of enforced repose.

MR. W. H. CLARK, formerly Superintendent of the Marshall (Texas) Gas Company, died at his home in that city, about a fortnight ago.

AT the December meeting of the East St. Louis City Council an ordinance was passed extending the public lighting contract with the Citizens Electric Light Company, from 3 to 10 years. The three-year contract provided for the maintenance of 60 arcs (2,000-candle power each), at the rate of $125 per annum each, and as many additional lights as the Council should call for, the extra lights to be paid for at the rate of $110 per annum each, a moontable to be the rule in the case of both classes of lamps. Under the amended extended contract the payments remain the same, but the contractors agree to keep the lamps in service from dusk to daylight on every night in the year.

RUMOR has it that the authorities of Cape May, N. J., are considering the advisability of purchasing the local gas works with a view to placing the same under municipal control.

ON the 4th inst. an explosion occurred in the purifying house of the Doyleston (Pa.) Gas Company, wrecking the building, but, happily, the disaster was not attended with loss of life. This is all the more remarkable, as Superintendent James Kane and laborer Dorsey were within a few yards of the southeast wall of the wrecked building when the latter came down. Repairs were at once made on the apparatus, and gas was shut off from the town for less than 4 hours. The damage amounted to $750.

THE Wyandotte (Kas.) Gas Company has filed an acceptance of the ordinance permitting it to purchase gas from the Kansas City (Mo.) Gas and Coke Company.

THE Gas Light Company, of Galena, Ills., has passed into the control of Chicago capitalists. The plant will be managed by Mr. H. S. Raymond.

CITY Works Commissioner Adams, of Brooklyn, will, on Wednesday, open bids for the public lighting of the city, for one year from January 1st, next.

THE following Companies are still delinquent in the matter of sending in their returns to the Massachusetts State Gas and Electric Light Commission: The Weymouth Light and Power Company, Citizens Gas Light Company, of Quincy, and the Gardner Gas Light Company.

ARTICLES respecting the incorporation of the Plainfield (N.J.) Gas and Electric Light Company (which is an amalgamation of the powers and properties of the local gas and electric light companies) have been filed. The joint capital is $175,000, and Mr. Elias R. Pope has been chosen President.

THE Committee appointed by the Trustees of Seattle, Wash., to investigate the matter of the cost of electricity and gas for street lighting, advise as the result of their examination that contracts for such service be made not to exceed the limit of one year, in order that the city, when it determines to operate a municipal lighting plant, will not be delayed in that respect by the existence of a long-term contract with private parties.

COLUMBIA, Tenn., enjoyed (?) last week a bit of practical experience with electric arc lighting, which like experience often appeals to the residents of localities that depend upon dynamos and engines for the spark in the lamp that is to light them on their way. The governor on the engine in the local electric lighting works refused to perform its duty, whereupon the flywheel, in due time, resolved itself into several pieces, and Columbia was in darkness—so far as arc lighting was concerned.

## Municipal Control of Electric Plants.

The *Western Electrician* says that an effort will soon be made by the city of Chicago to secure the passage of an enabling act by the Legislature providing for the establishment of electric light plants for commercial work. The City Council has authorized the appointment of a committee composed of the Mayor, Comptroller, Chairmen of the Judiciary and Finance Committees of the Council, and one representative citizen whose name has not yet been announced. This committee will consider several suggestions made in the recent communication of the Mayor relative to public works and local improvements. One of the most important measures under consideration is the question of municipal electric light plants. Mayor Cregier has advocated the establishment of commercial plants since his election to office. At present the city has no authority to engage in commercial lighting, and this power can only be conferred by the State Legislature. For this reason the committee has been selected to take the necessary steps to secure the passage of the act by the Legislature.

City Electrician Barrett has placed himself upon record as opposed to any scheme that will interfere with franchises now held by local companies. The fact that these companies have gone into the business, invested large sums of money in the establishment of their plants and the development of their systems, should insure for them recognition of their rights. "If the city should decide to engage in commercial lighting," said Prof. Barrett, "it should in justice to these local companies buy the franchises and plants now in their possession. Otherwise, the city should allow the companies to continue without opposition until the expiration of the terms of their franchises. These men have invested their money in good faith, and common decency demands that their rights be respected."

When the Legislature is petitioned to grant the city the power to engage in commercial lighting, the interests of the local companies will undoubtedly be represented by the Illinois State Electric Light Association. It will be remembered that this organization was formed under the auspices of the National Electric Light Association to protect the members from unjust legislation. Several attempts had been made throughout the country to pass bills opposed to the interests of electric companies, and the National Association deemed it expedient to organize State Associations to look after this work and protect the interests of the members. This is the first time the Illinois Association has been called upon to take action, but it will undoubtedly prove equal to the occasion.

## Gas Stocks.

**Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,**

16 Wall St., New York City.

December 15.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

| | Capital. | Par. | Bid | Asked |
|---|---|---|---|---|
| Consolidated | $35,430,000 | 100 | 88½ | 89½ |
| Central | 500,000 | 50 | 90 | 95 |
| " Scrip | 220,000 | — | 95 | 100 |
| Equitable | 4,000,000 | 100 | 116 | 120 |
| " Bonds | 1,000,000 | — | 113 | 115 |
| Harlem, Bonds | 170,000 | — | — | — |
| Metropolitan, Bonds | 658,000 | — | 110 | 115 |
| Mutual | 3,500,000 | 100 | 115 | 120 |
| " Bonds | 1,500,000 | — | 100 | 102 |
| Municipal, Bonds | 750,000 | | — | — |
| Northern | | 50 | — | — |
| " Bonds | 150,000 | — | — | 100 |
| Standard Gas Co— | | | | |
| Common Stock | 5,000,000 | 100 | — | 48 |
| Preferred | 5,000,000 | 100 | — | 90 |
| Yonkers | | 50 | 112 | — |
| Richmond Co., S. I. | 346,000 | 50 | — | — |
| " Bonds | 20,000 | — | — | — |
| **Gas Co's of Brooklyn.** | | | | |
| Brooklyn | 2,000,000 | 25 | 116 | 120 |
| Citizens | 1,200,000 | 20 | 98 | 100 |
| " S. F. Bonds | 320,000 | 1000 | 100 | 103 |
| Fulton Municipal | 3,000,000 | 100 | — | 136 |
| " Bonds | 300,000 | | 100 | 105 |
| Peoples | 1,000,000 | 10 | 85 | 90 |
| " Bonds (7's) | 368,000 | — | 100 | — |
| " " (6's) | 94,000 | — | 100 | — |
| Metropolitan | 1,000,000 | 100 | 105 | 110 |
| Nassau | 1,000,000 | 25 | 130 | — |
| " Ctfs | 700,000 | 1000 | 95 | 100 |
| Williamsburgh | 1,000,000 | 50 | 128 | 130 |
| " Bonds | 1,000,000 | — | 108 | 112 |
| **Out of Town Gas Companies.** | | | | |
| Boston United Gas Co.— | | | | |
| 1st Series S.F. Trust | 7,000,000 | 1000 | — | 87 |
| 2d " " " | 3,000,000 | 1000 | — | 75 |
| Bay State Gas Co.— | | | | |
| Stock | 5,000,000 | 50 | 52 | 54 |
| Income Bonds | 2,000,000 | 1000 | 95½ | — |
| Buffalo Mutual, N. Y. | 750,000 | 100 | 90 | 95 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Citizens, Newark | 1,000,000 | 50 | 155 | 160 |
| " " Bonds | 45,000 | — | — | — |
| Chicago Gas Company | 25,000,000 | 100 | 35½ | 35¾ |
| Chicago Gas Light & Coke Co.— | | | | |
| G't'd Gold Bonds | 7,650,000 | 1000 | 84¾ | 85½ |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1000 | — | 98 |
| People's Gas and Coke Co., Chicago— | | | | |
| 1st Mortgage | 2,100,000 | 1000 | — | 100 |
| 2d " | 2,500,000 | 1000 | 94 | 98½ |
| Consumers Gas Light Co., Jersey City | 2,000,000 | 100 | — | 30 |
| Bonds | 600,000 | 1000 | 80 | — |
| Cincinnati G. & C. Co. | 6,500,000 | 100 | 204 | 205 |
| Consumers Toronto | 1,000,000 | 50 | 190 | 200 |
| Central, S. F., Cal | | | 80 | 90 |
| Capital, Sacramento, Cal | | | 58 | |
| Consolidated, Balt | 11,000,000 | 100 | 45½ | 45⅞ |
| " Bonds | 6,400,000 | | 107 | 107½ |
| Citizens Gas Lt. Co., Rochester, N. Y. | 500,000 | — | 85 | 110 |
| Bonds | 250,000 | | — | — |
| East River Gas Co., Long Island City | 1,000,000 | 100 | 100 | 105 |
| Bonds | 500,000 | 100 | 100 | 102 |
| Hartford, Conn | 750,000 | 25 | 102 | 108 |
| Jersey City | 750,000 | 20 | 165 | 170 |
| Louisville, Ky | 2,570,000 | 50 | 125 | 130 |
| Little Falls, N. Y. | 50,000 | 100 | — | 100 |
| " Bonds | 25,000 | — | 100 | 103 |
| Laclede Gas Light Co., St. Louis, Mo.— | | | | |
| Common Stock | 7,500,000 | 100 | 11 | 15 |
| Preferred " | 2,500,000 | 100 | 50 | 55 |
| Bonds | 9,034,400 | 1000 | 70 | 71 |
| Montreal, Canada | 2,000,000 | 100 | 200 | 208 |


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Our system is such that we can furnish plants that will carburet 50,000 cubic feet in 24 hours, or three or four million feet in the same length of time. *One* of our large benches or plants would be capable of generating 100,000 cubic feet of gas in 24 hours, which would raise the candle power on 2,000,000 feet (taking as a standard coal gas at 15 candles) 3 candles on the 2,000,000 feet, enabling the works to deliver to consumers an 18 candle gas; or, enlarging our plant, the candle power may be increased as desired, at the same cost per candle power, less interest on plant.

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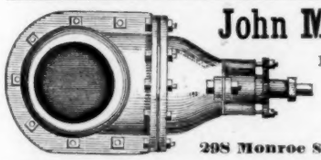

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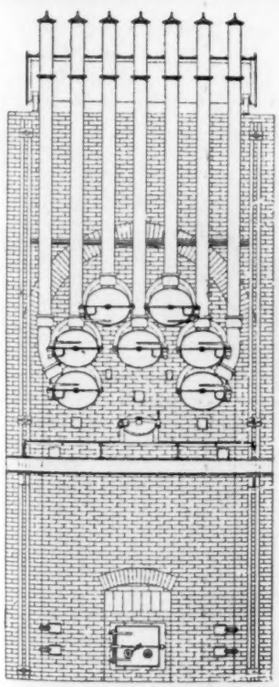

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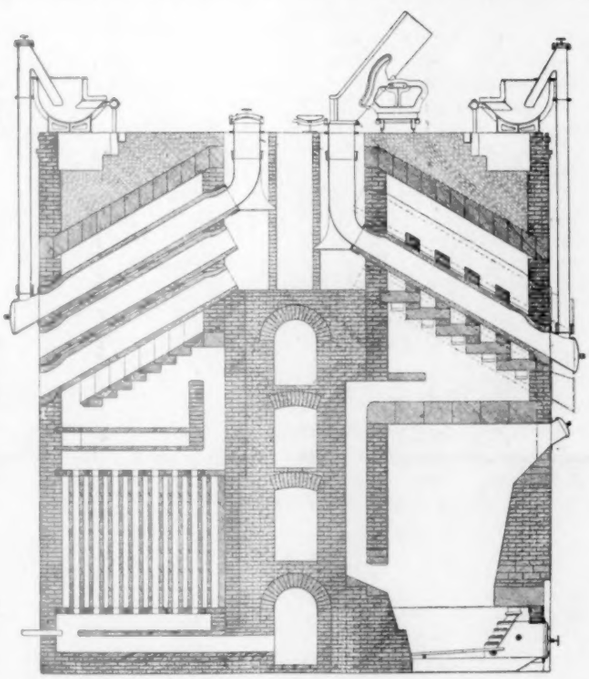

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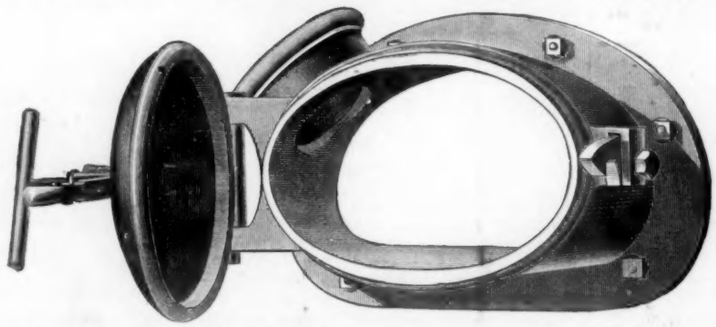

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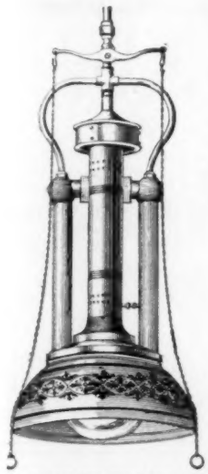

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**At the Fall Session of the Board of Supervisors of Winnebago County, held at the County Court House, Oshkosh, Wis., Nov. 26, 1889, the report submitted by Mr. C. W. Cook, Chairman of the Committee on Public Buildings, recommending the use of the Welsbach Incandescent Gas Burner in the Buildings under their charge, was unanimously adopted, because of the extreme economy in the consumption of Gas and the superior character of the light obtained.**

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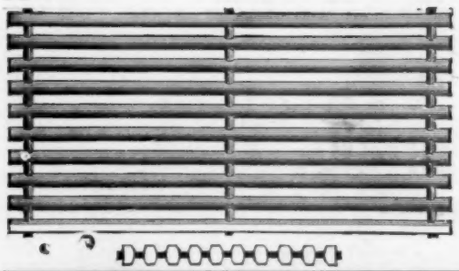

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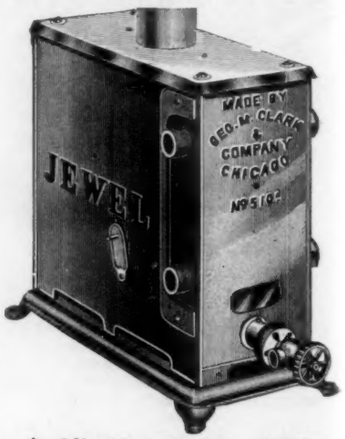


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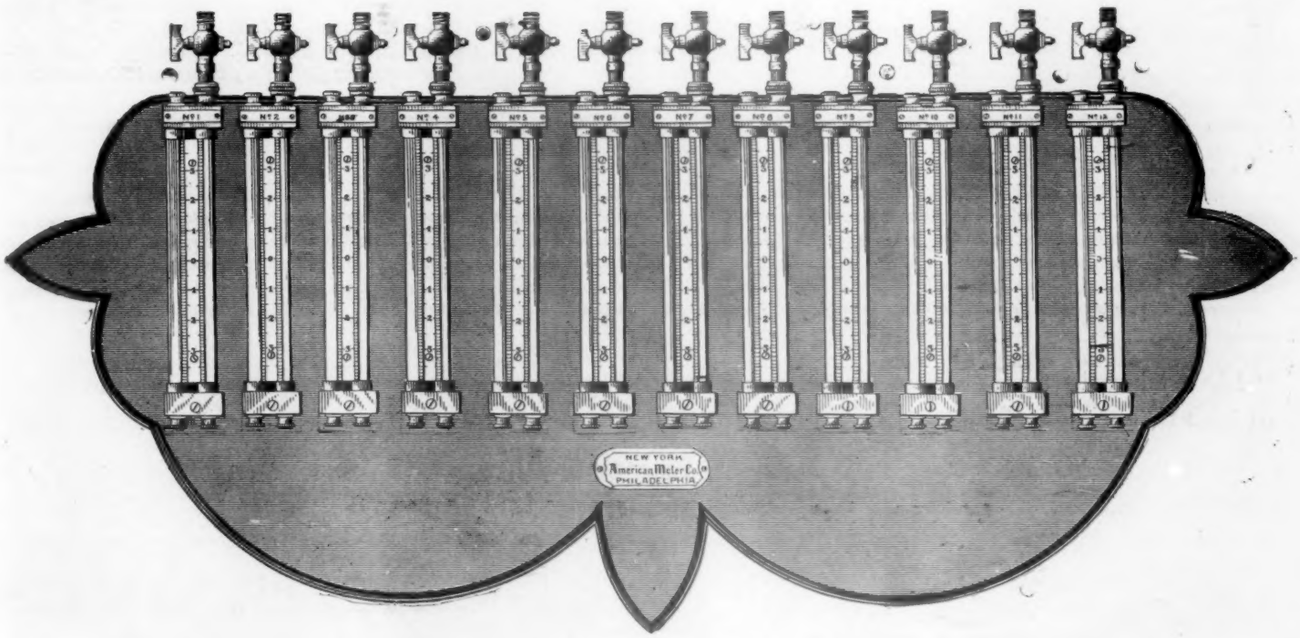


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THE

# WALKER TAR AND CARBONIC ACID EXTRACTOR.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus, and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company. It would be manufactured in the following sizes:

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|---|---|---|---|---|---|---|---|---|---|---|
| No. 1, | 50,000 | to | 100,000 | cu. ft. | per | 24 hrs., | 3 ft. | square, | 5 ft. | deep. |
| No. 2, | " | " | 125,000 | " | " | " | 4 " | " | " | " |
| No. 3, | " | " | 250,000 | " | " | " | 5 " | " | " | " |
| No. 4, | " | " | 500,000 | " | " | " | 6 " | " | " | " |
| No. 5, | " | " | 750,000 | " | " | " | 7 " | " | " | |
| No. 6, | " | " | 1,000,000 | " | " | " | 8 " | " | " | |
| No. 7, | " | " | 1,250,000 | " | " | " | 9 " | " | " | " |
| No. 8, | " | " | 1,500,000 | " | " | " | 10 " | " | " | " |
| No. 9, | " | " | 2,000,000 | " | " | " | 12 " | " | " | " |
| No. 10, | " | " | 3,000,000 | " | " | " | 15 " | " | " | " |

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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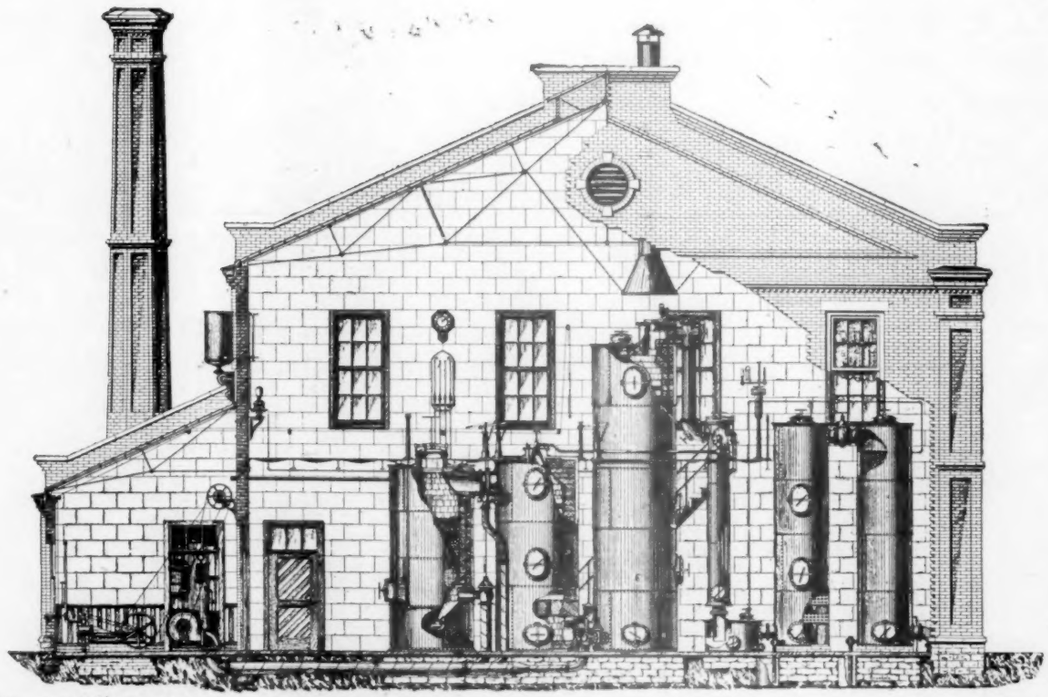

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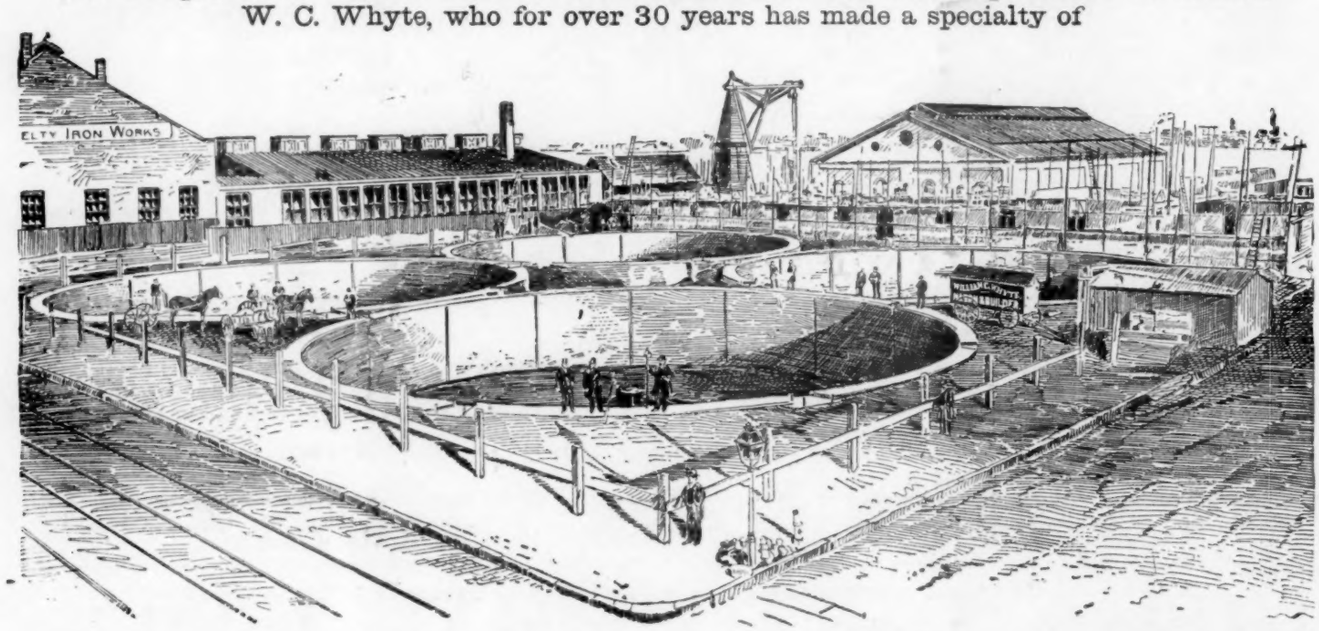


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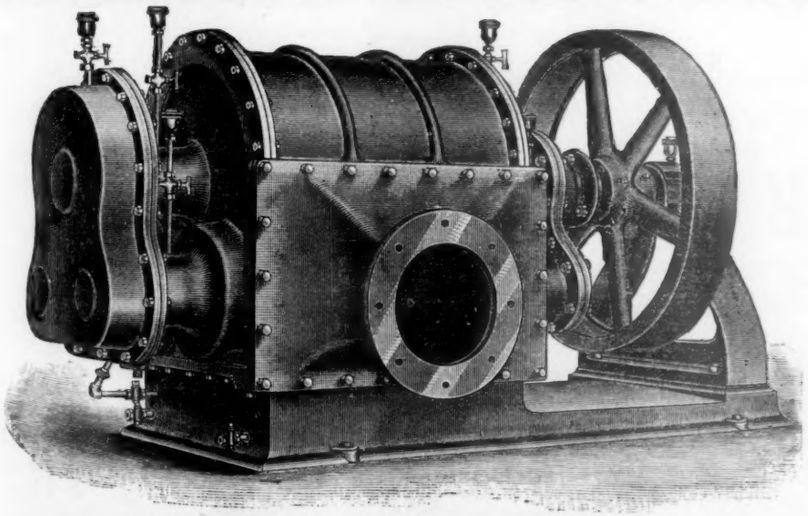

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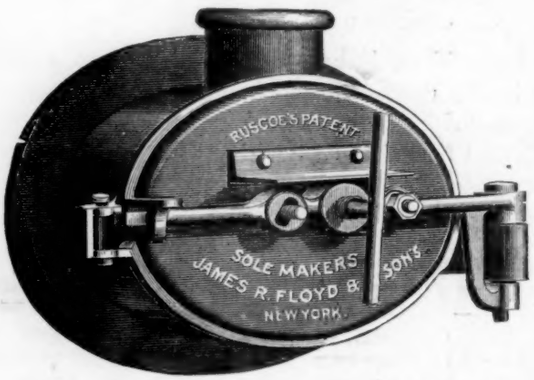


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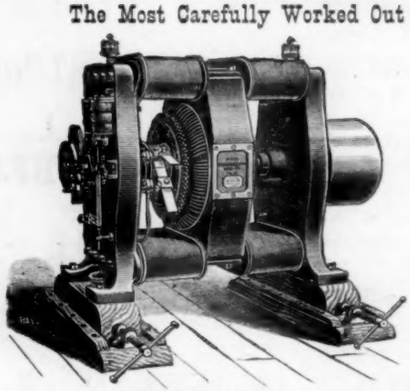

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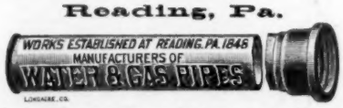


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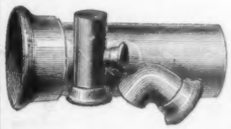

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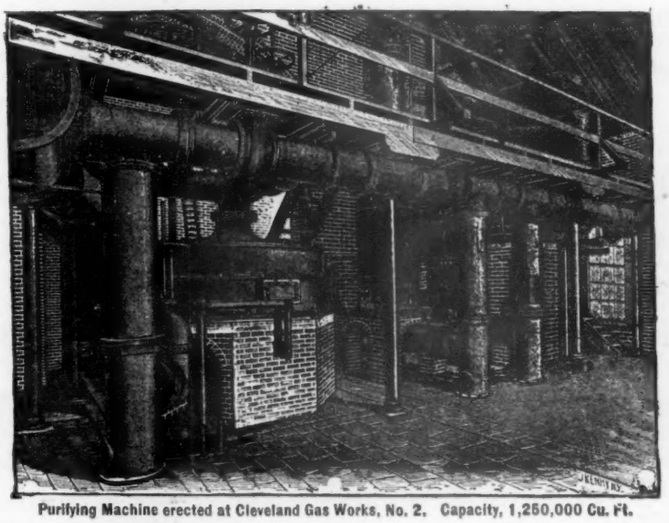

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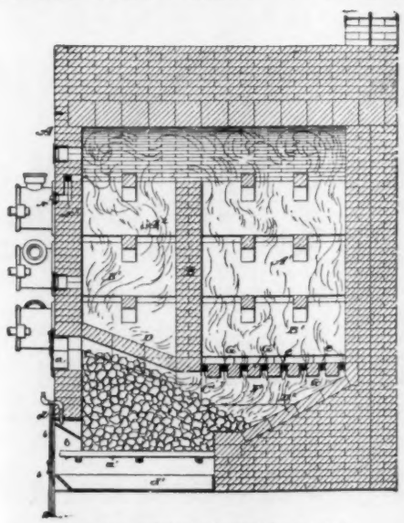

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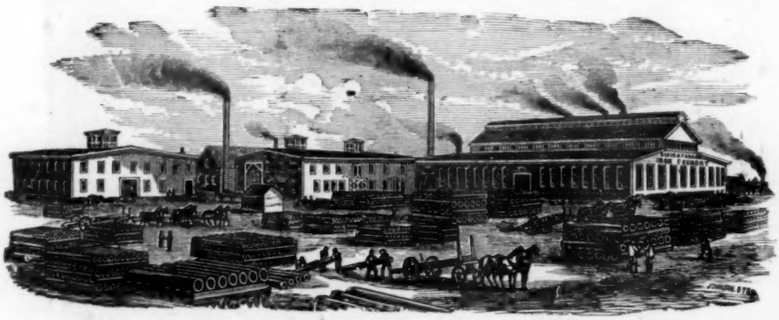

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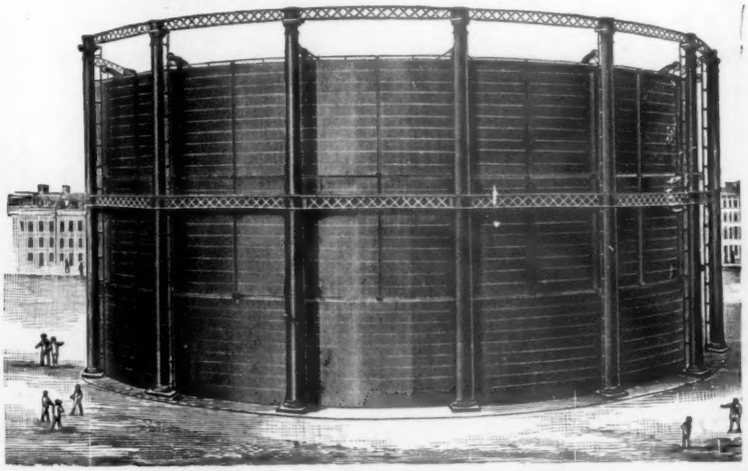

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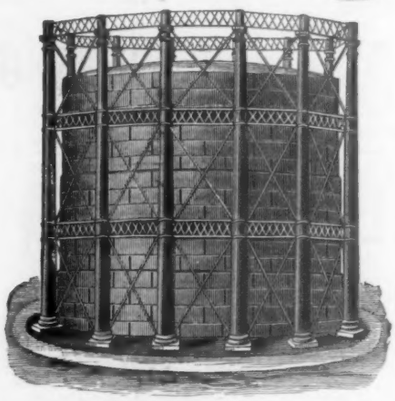

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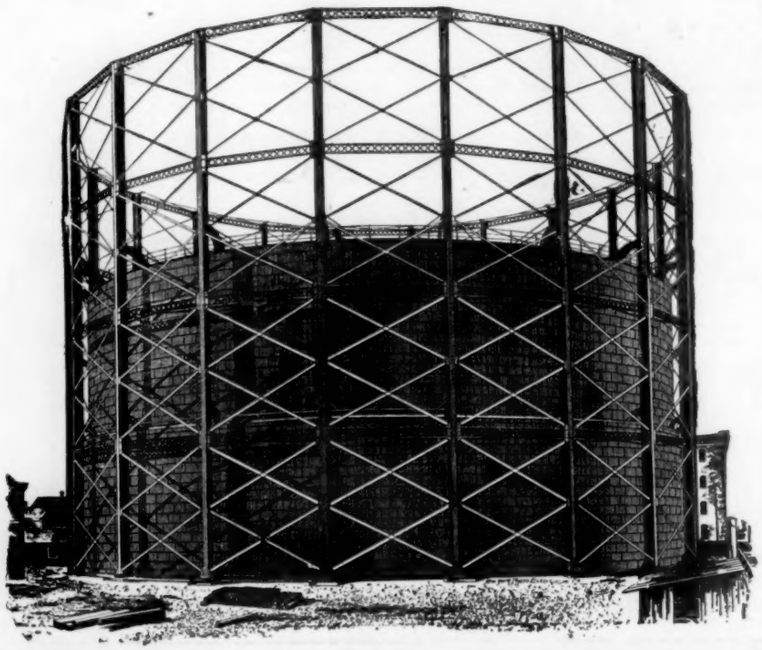

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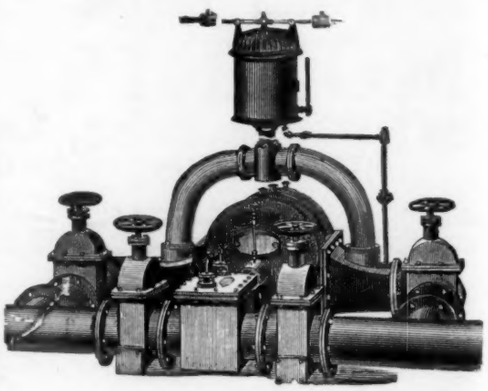

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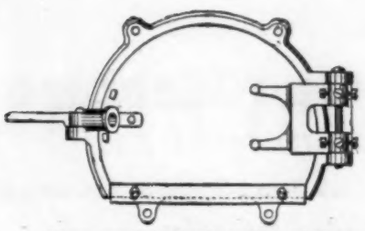

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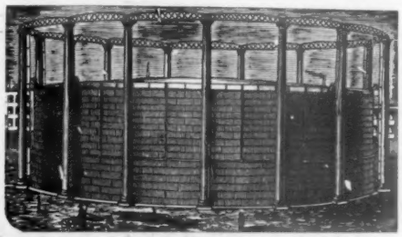

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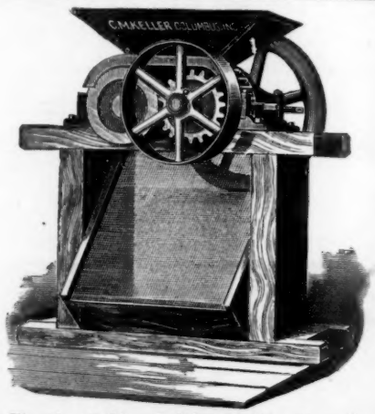


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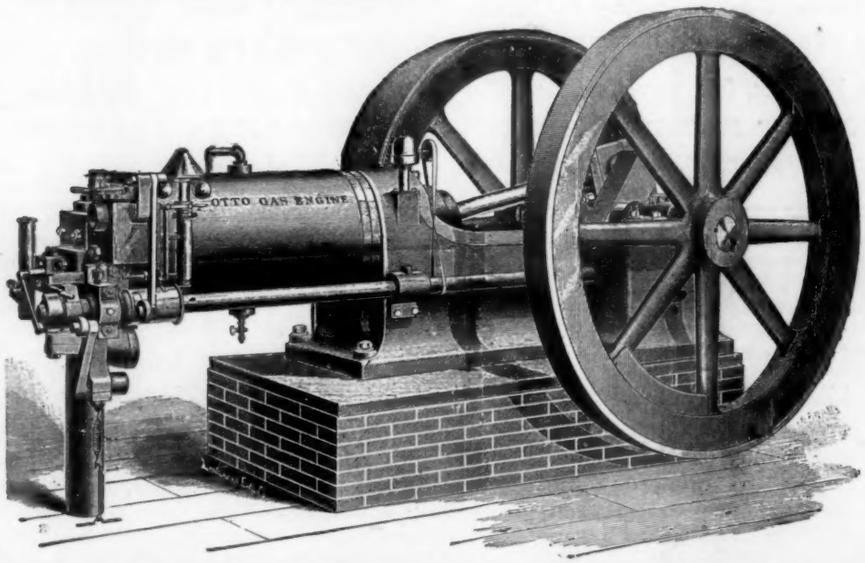


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